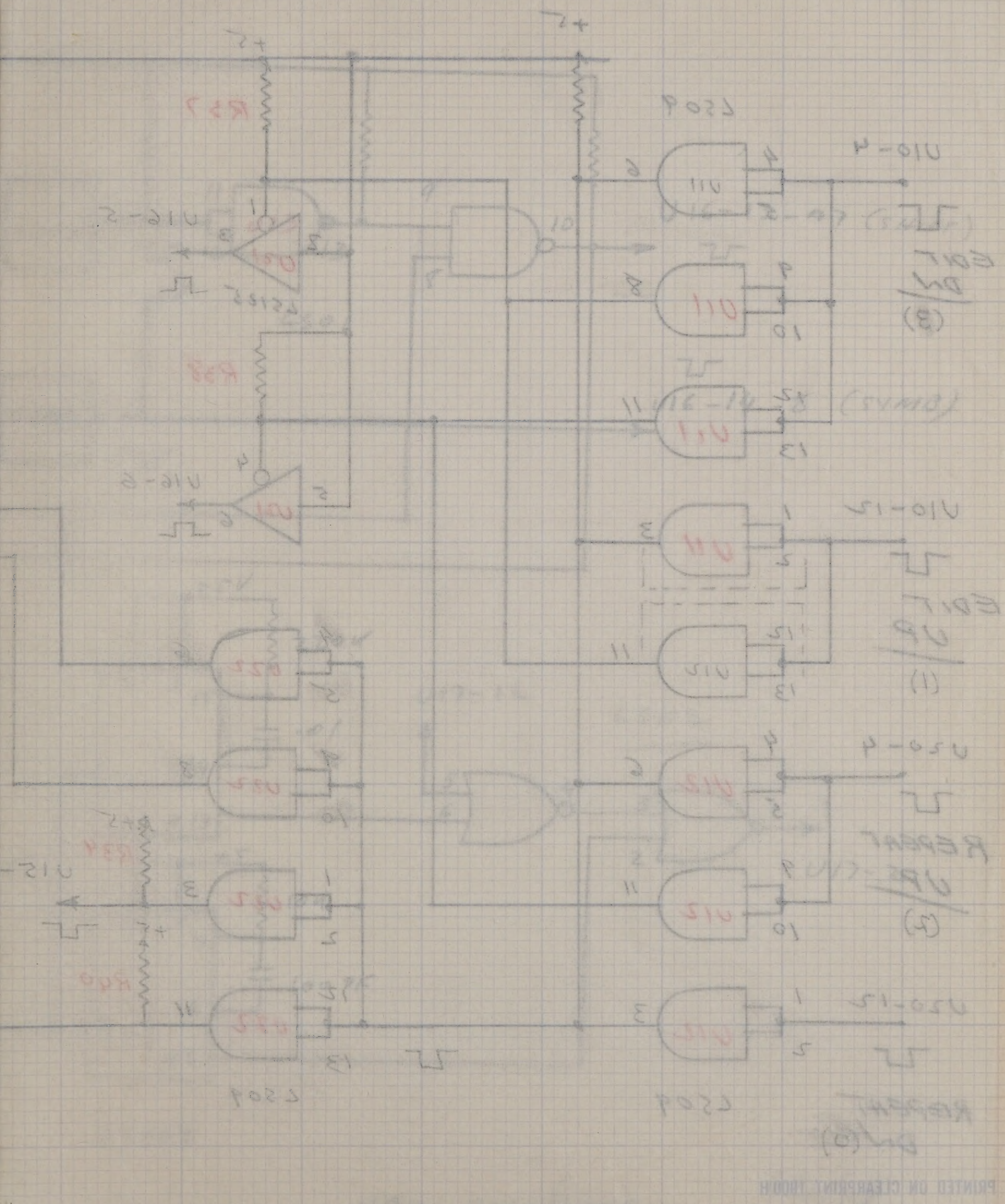
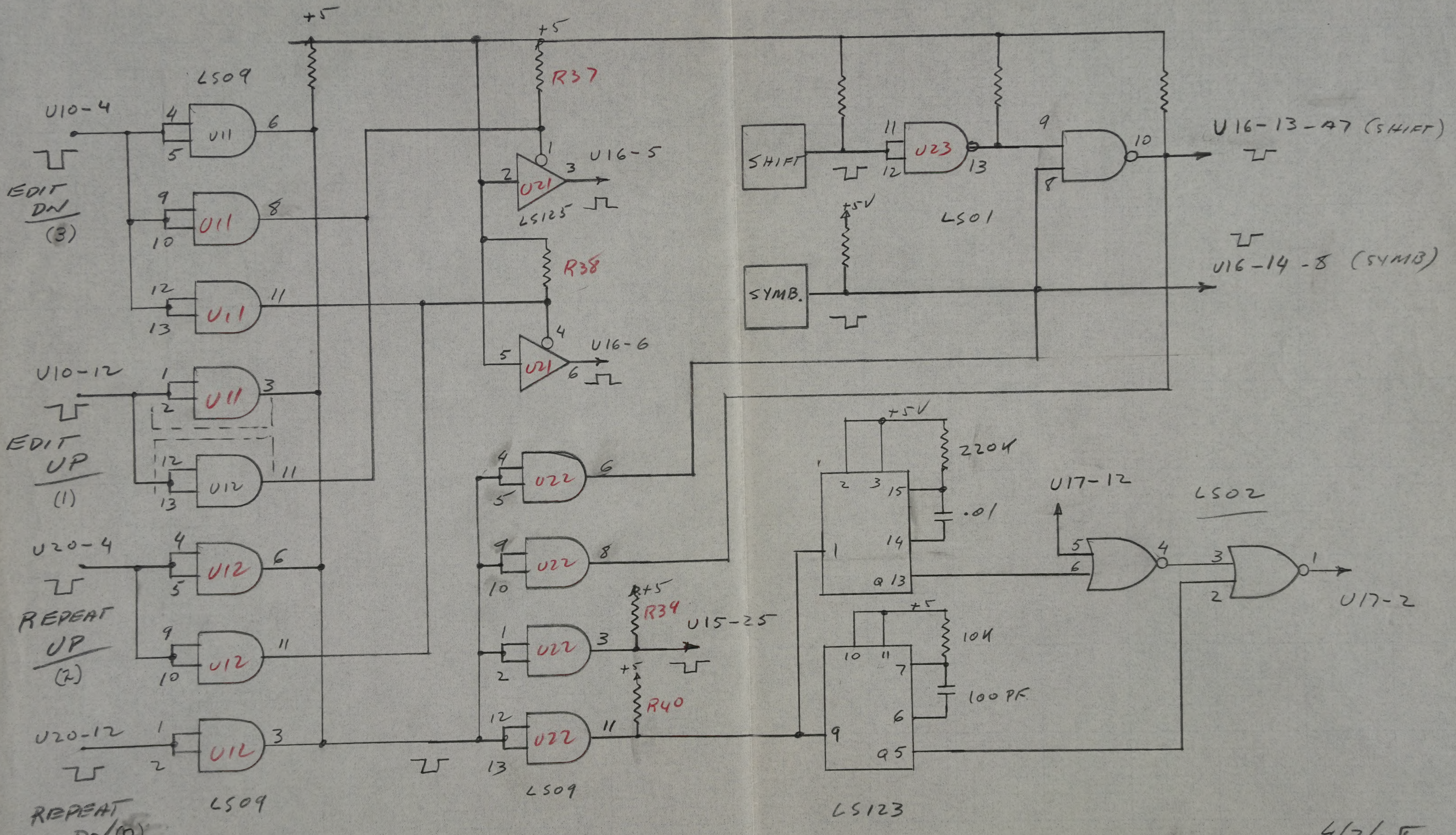
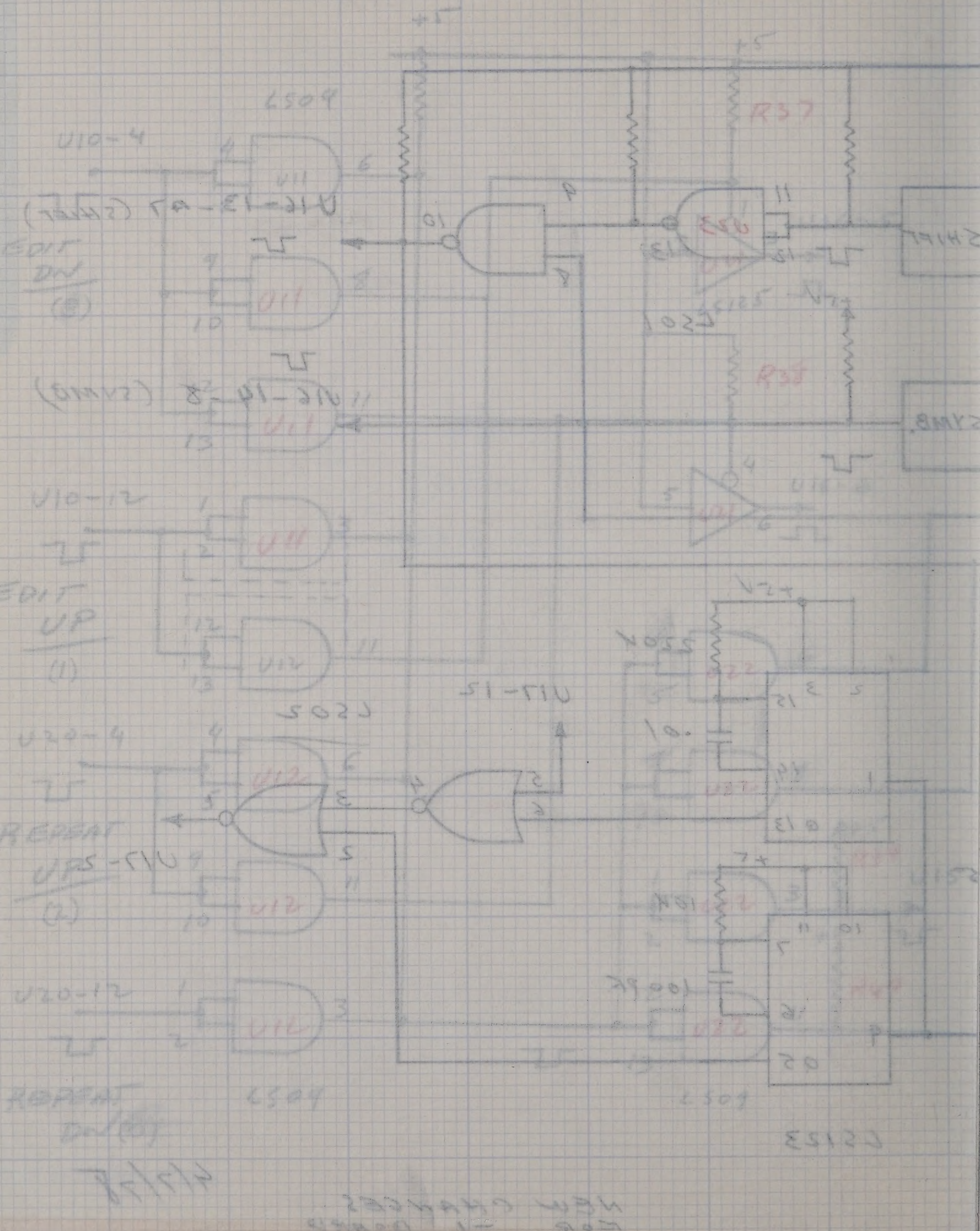
SEA WATCH
1016014

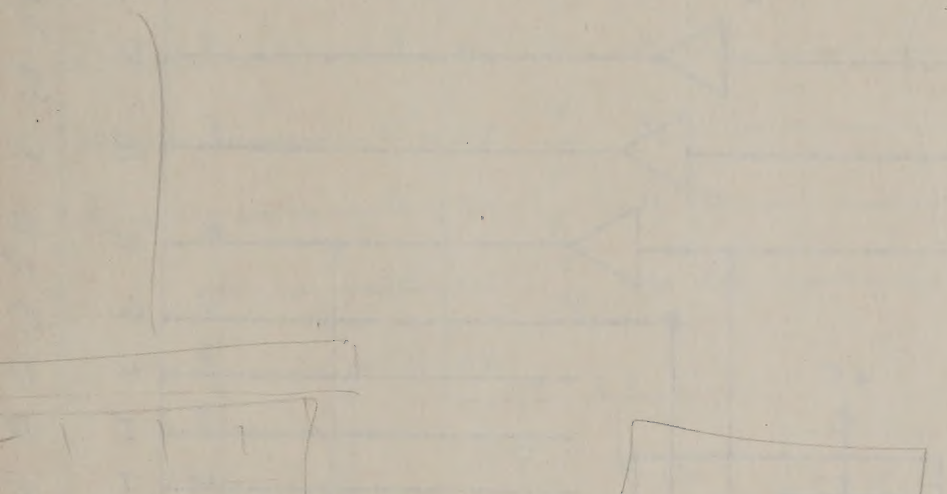


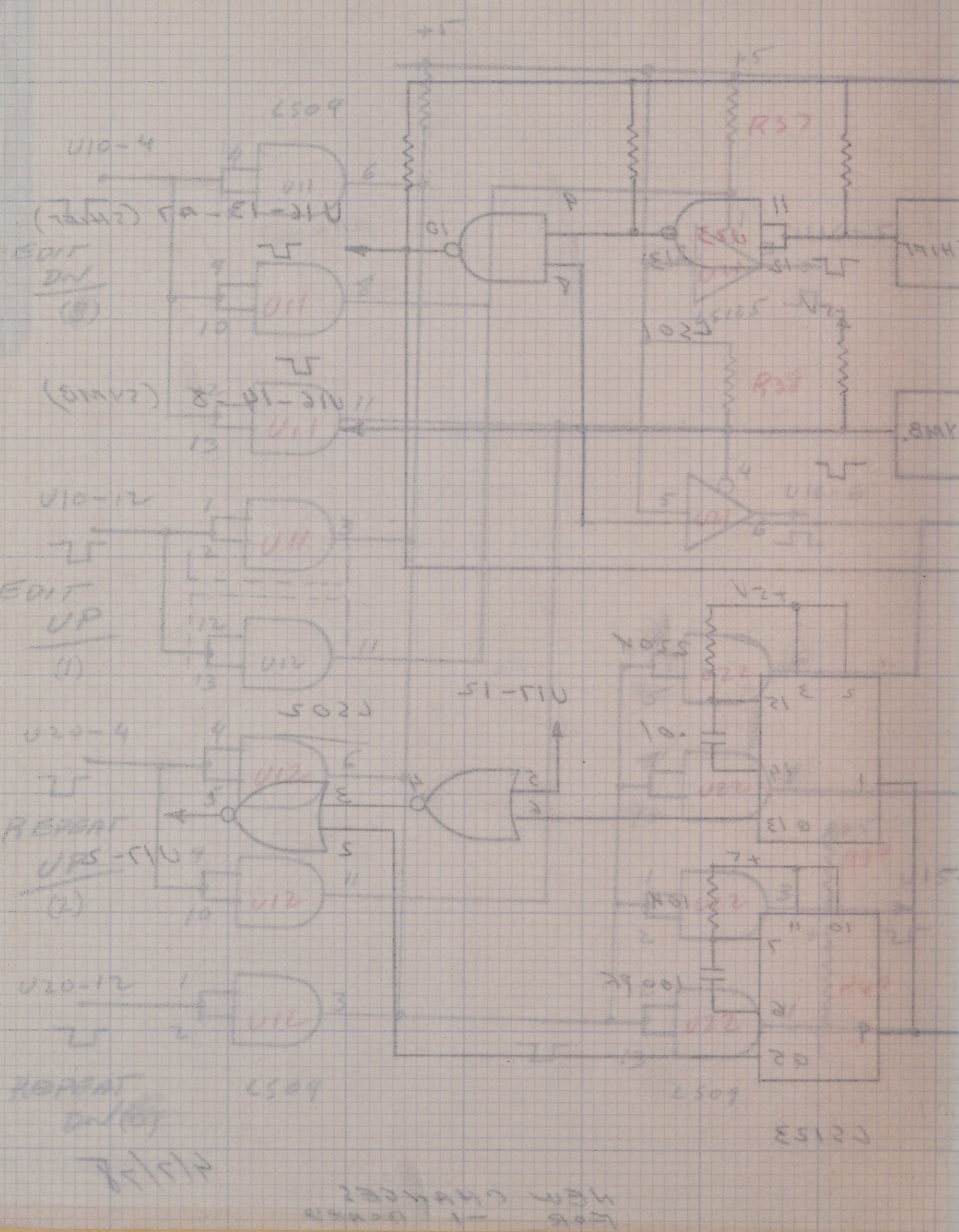


4/7/78

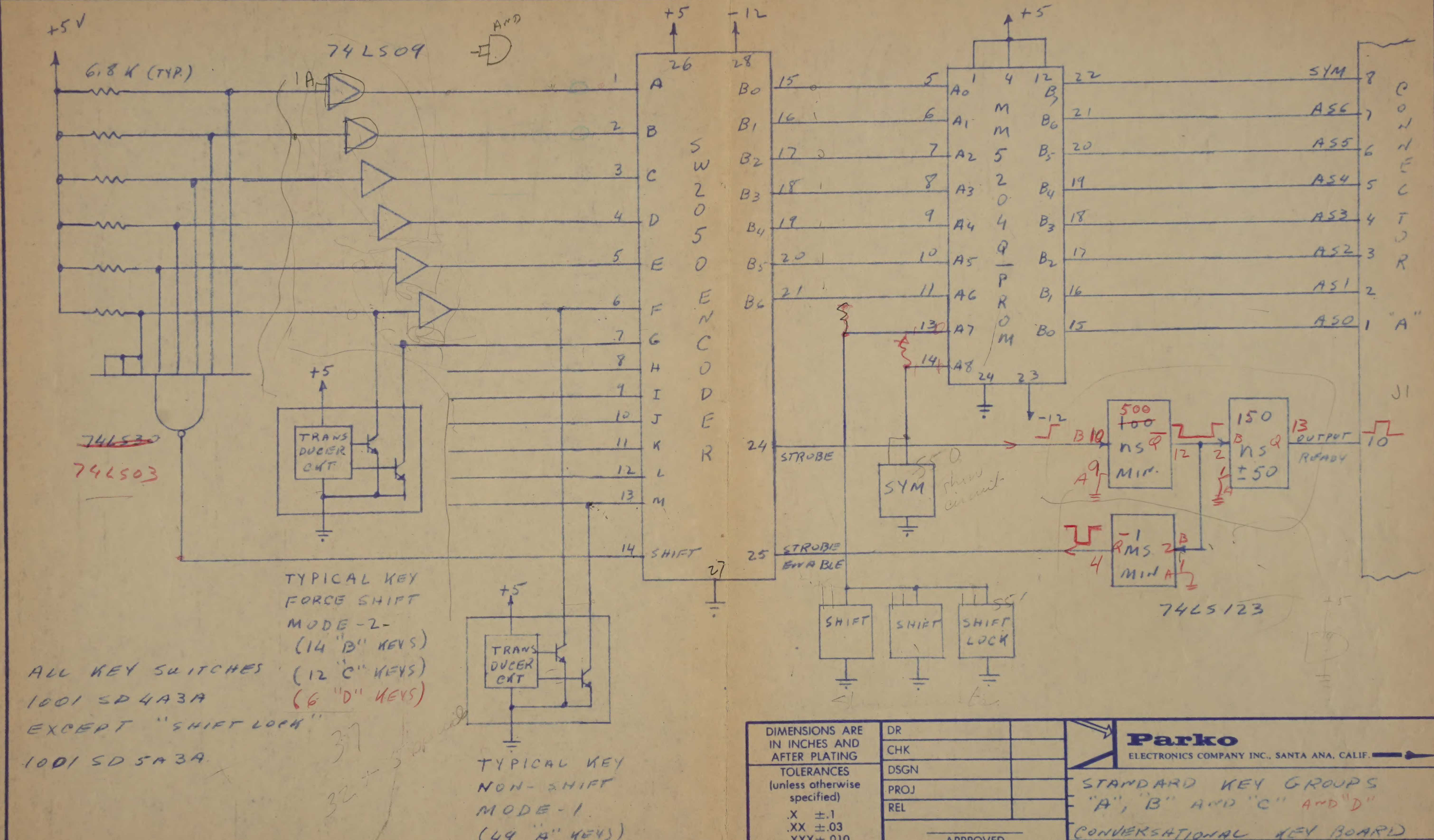
NEW CHANGES
FOR -1 BOARD


U10-4
U10-12
R37
R38





LS04
LS02
LS123
U10-4
U10-12
U17-12
R37
R35
EDIT DN
EDIT UP
REPEAT
NEW CHANGES



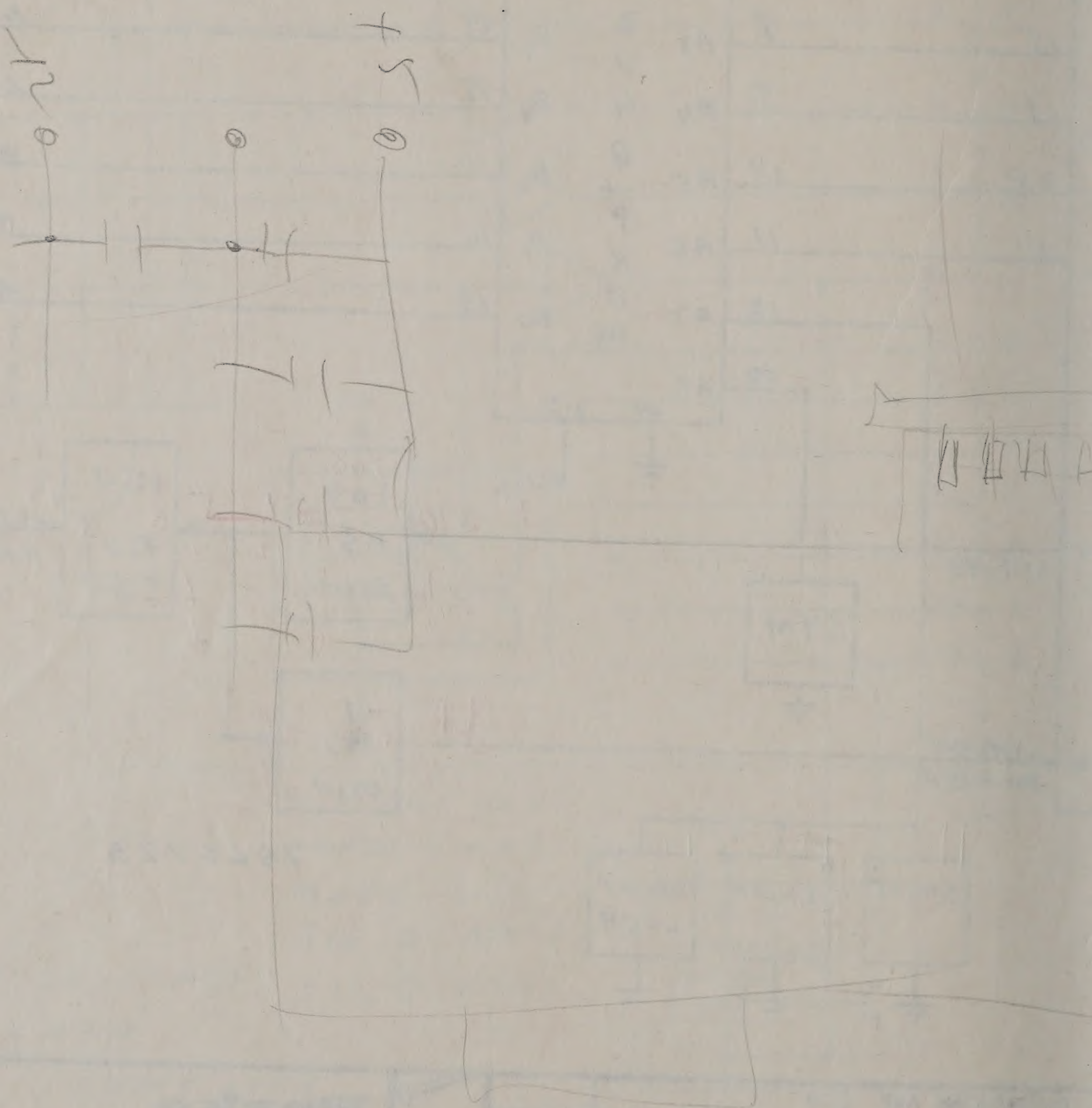
DIMENSIONS ARE IN INCHES AND AFTER PLATING	DR	
TOLERANCES (unless otherwise specified) .X ±.1 .XX ±.03 .XXX ±.010 ANGLES ±0.5°	CHK	
	DSGN	
	PROJ	
	REL	
	APPROVED	
MACH SURF ✓	APPROVED	
	DO NOT SCALE DRAWING	

Parko ELECTRONICS COMPANY INC., SANTA ANA, CALIF.

STANDARD KEY GROUPS "A", "B" AND "C" AND "D"

CONVERSATIONAL KEY BOARD

CODE IDENT NO.	SIZE		REV
13979	B		
SCALE		SHEET OF	



101699

SHEET 2

V8 AND V9

PIN NUMBERS

PCB-1 [illegible]

U22 6 & 8
REVERSED

P.C. BOARD

U7-4,5 TO 6

PARTS LIST
ADD SOCKETS

J1 & J2 PIN
NUMBERS (HEADINGS)
BACKWARDS
INSTALL ON BOTTOM
OF BOARD

SEA WATER 4/13/75

CHANGES TO BE MADE
PCB-2

~~HOLE SIZES AND DIMENSIONS ON~~
~~J8 - J9. (MOLEX)~~

~~J5, J6 - J7 - (MOLEX CONN) - HOLE~~
~~SPACING - SMALL ERROR, .156~~

—

~~SWITCH A17 ATT/UNATT. LOCATION~~
~~OF PINS~~

—

~~BASE OF Q5 TO R5 JUMPER~~

—

~~Q11 TO DS11 NO CONN~~
~~Q12 TO DS12 "~~

—

~~J12 - NUMBER PINS. SILKSCREEN TO~~
(IES)

—

~~J10 & J11 MARK ON TOP OF PCB~~
~~AND PIN NUMBER~~

—

~~Q88 - R92 JUMPER MISSING~~

—

~~U11 - PIN 13 TO PIN - 4~~

~~U12 - PIN 16 (NO POWER~~

—

~~J5, 6, 7, 8, 9 ALL MOLEX~~
~~CHANGE SO INDEX SIDE IS TO OUTSIDE~~

PART 30

CHANGE NUMBERS OF
VS ~~PIN~~ SO ~~SWITCH~~ INDICA
TOR ~~AND~~ CONNECTOR ARE SAME

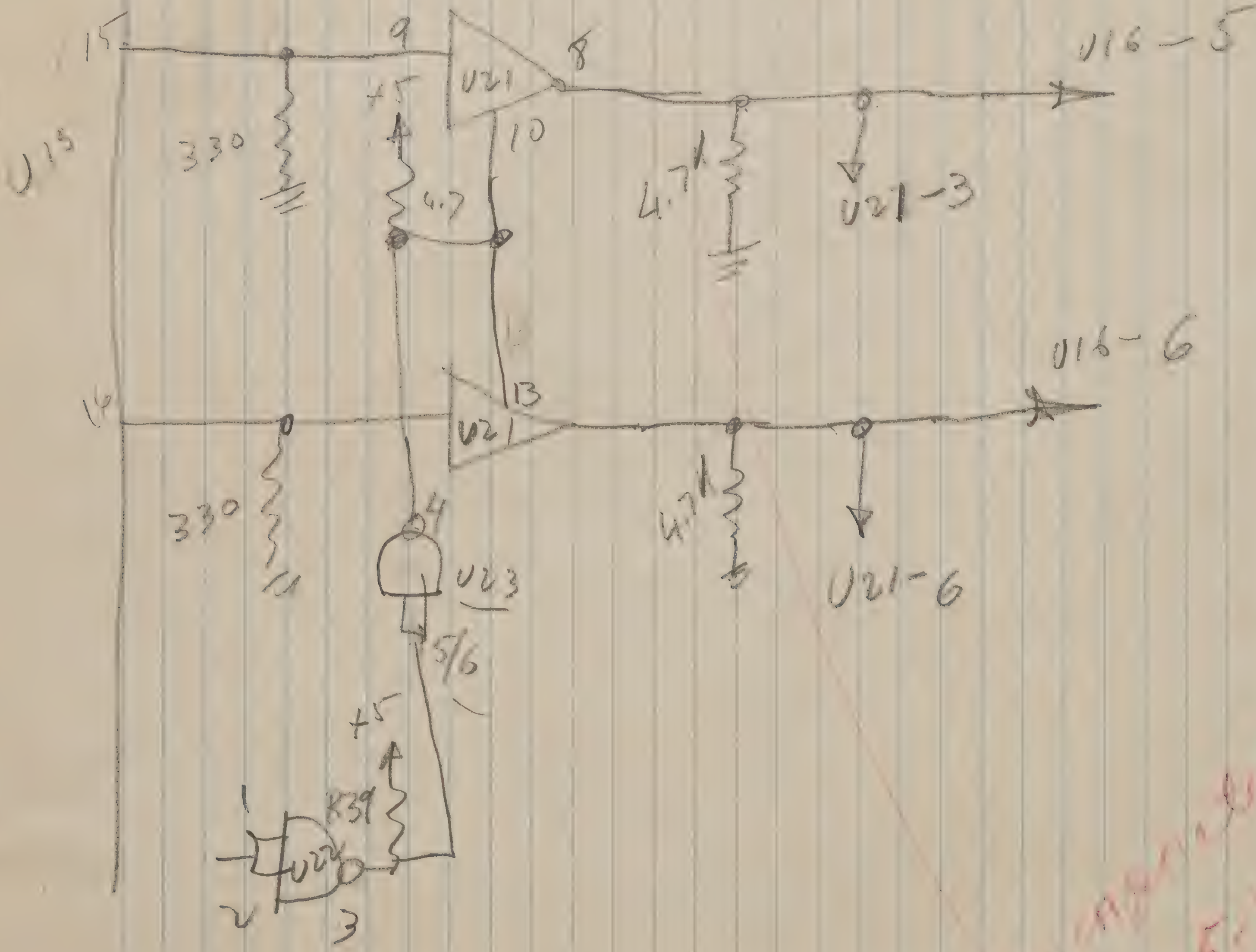
MODIFICATION ON
PCB-1

~~ZOOM BOARD~~
~~JUMPER FROM C4, R10 TO~~
~~U4-15~~

PCB-1 – ~~ADD R36~~
~~U15-25 TO 26~~

P.C.B 1 – .062" THICK.

PCB-1 MOD



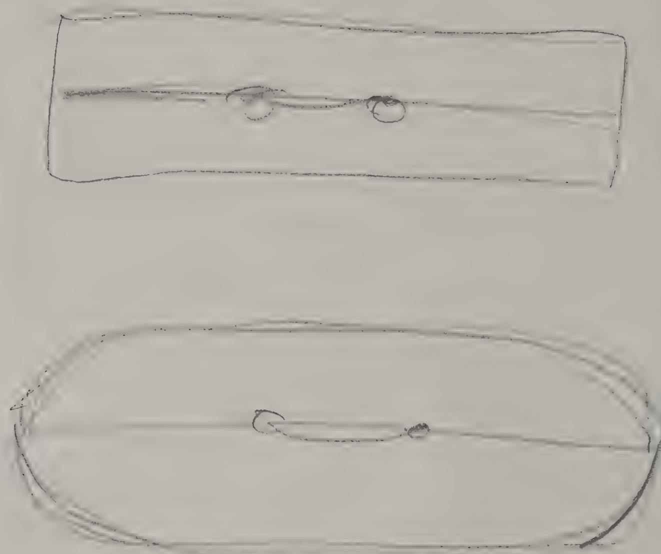
[illegible]
5-2-78

Sea Watch

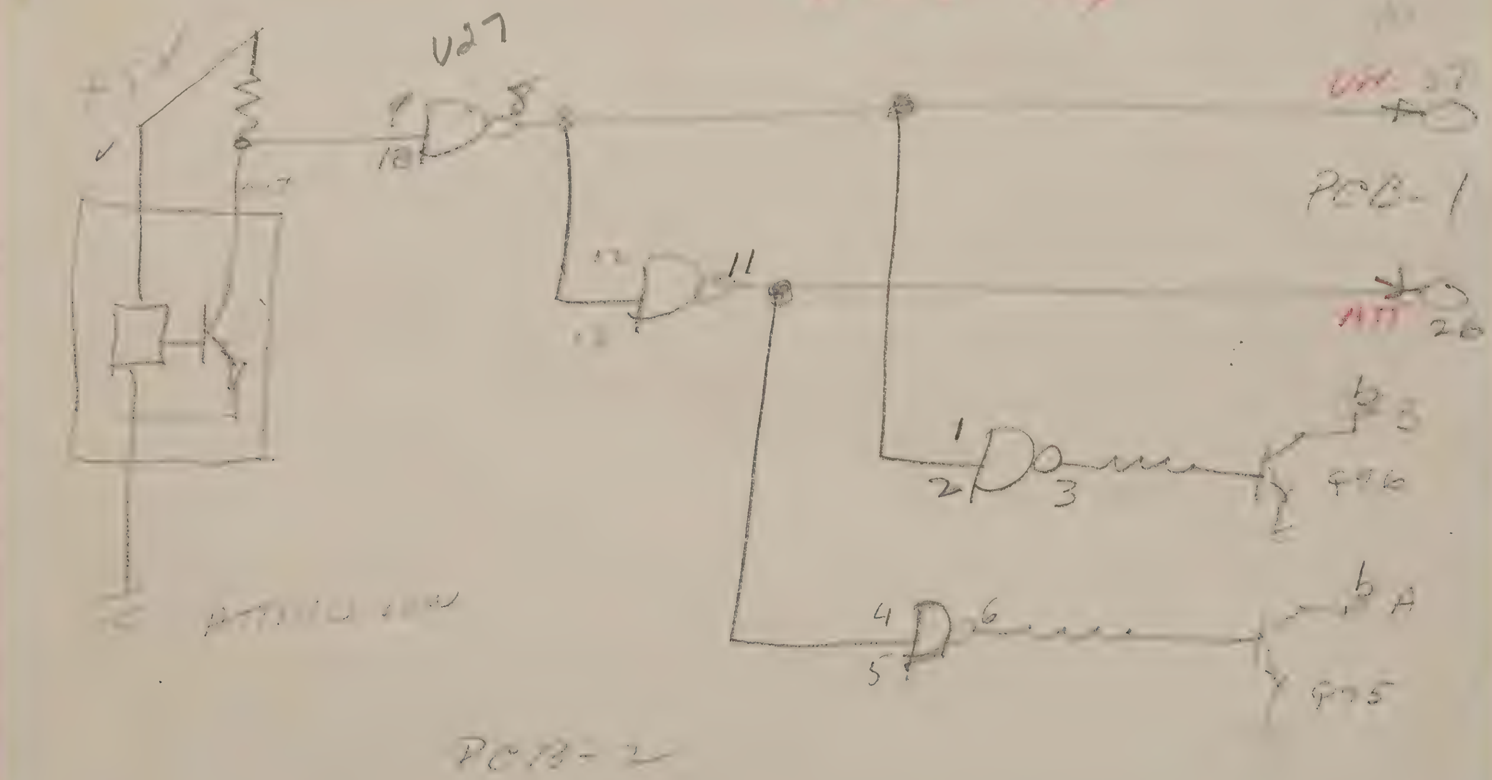
standoffs in
Sub Panel is

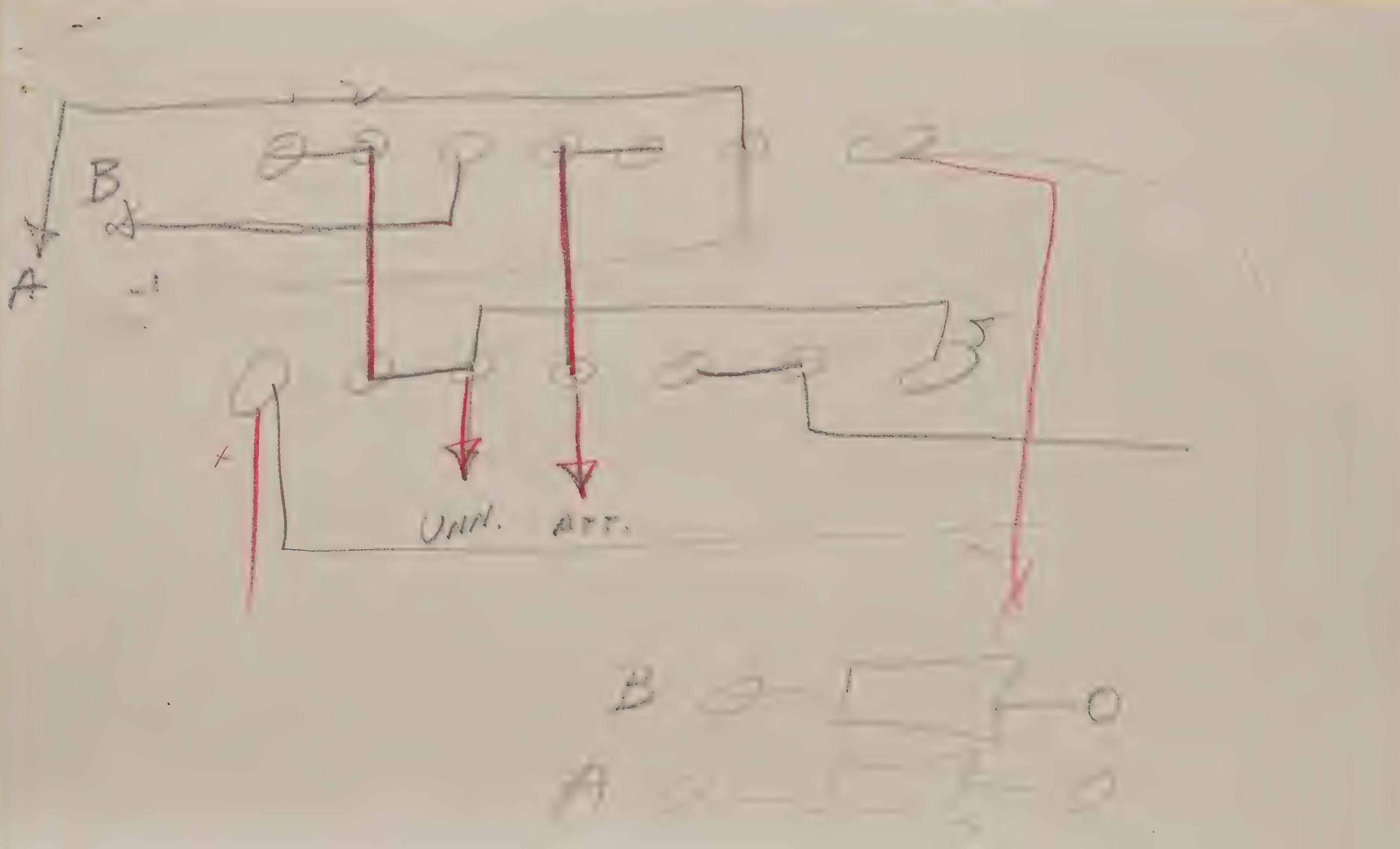
.280 DIA MAX

4
1.120

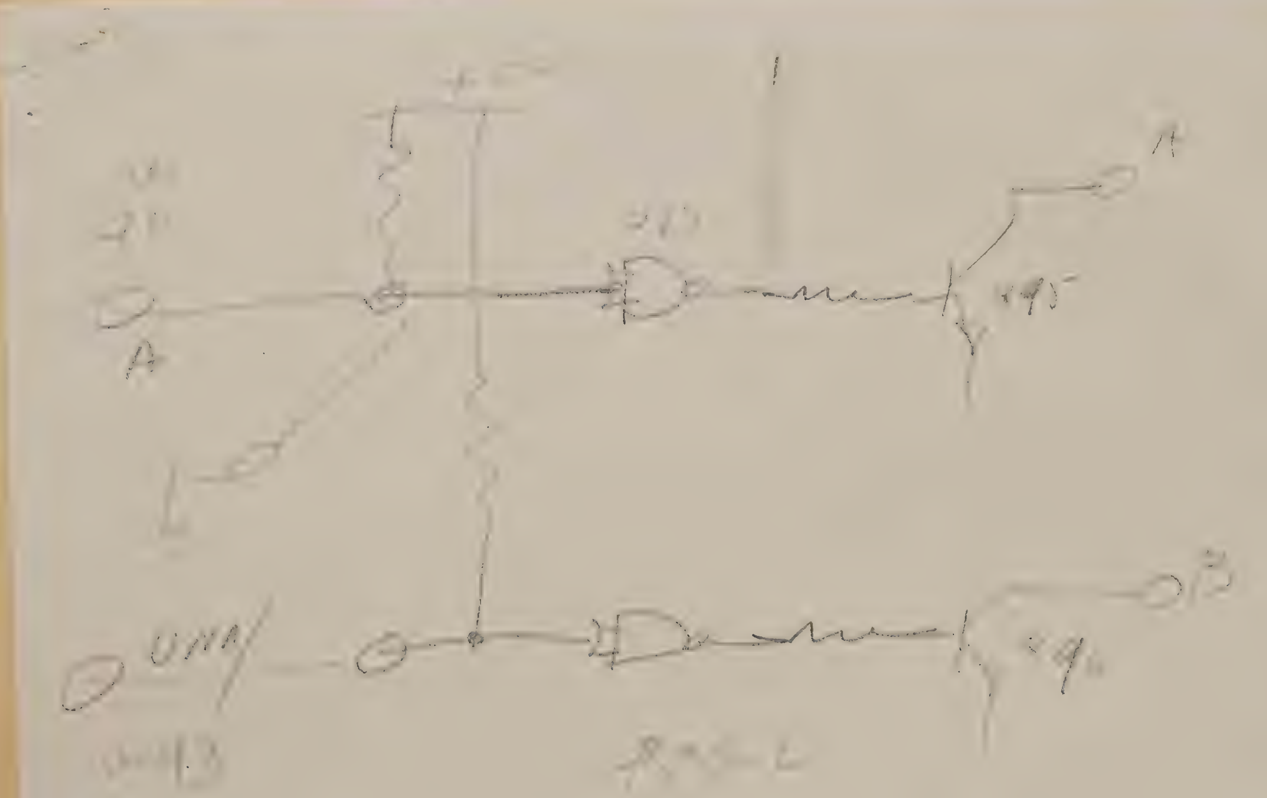


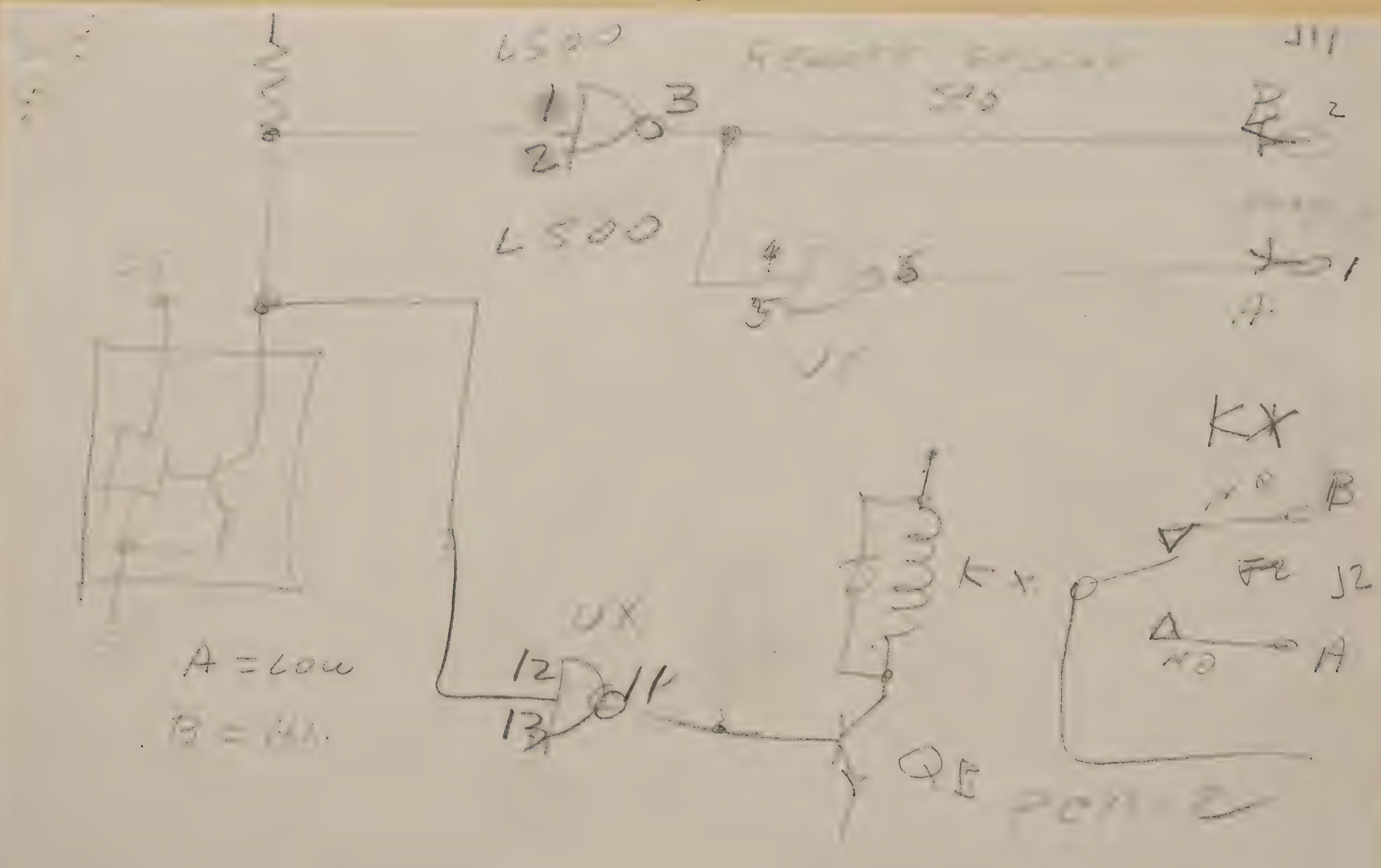
ATT/ UNATT — AML-14

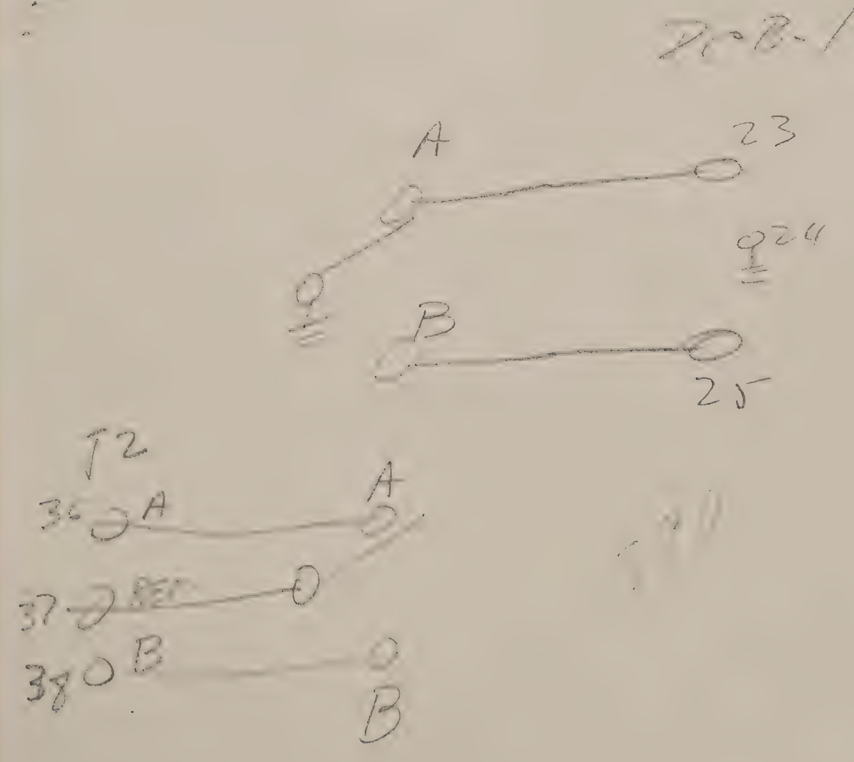


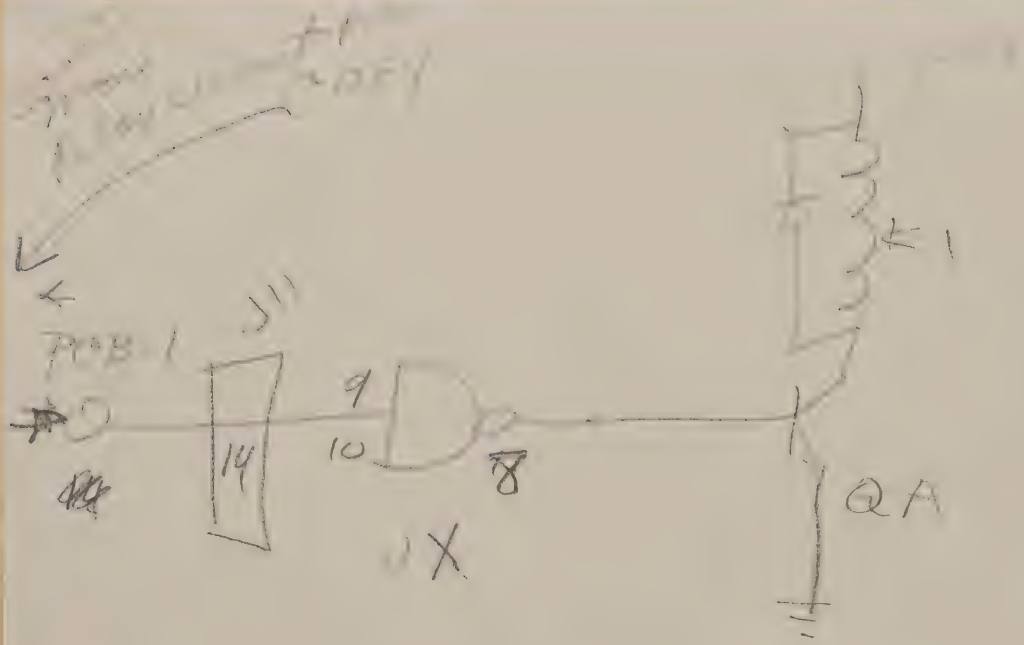


A
B
UNN.
ATT.
B
A


A
A
B


LS00
1
2
3
LS00
4
5
6
J1
2
1
KX
B
J2
A
NO
K X
UX
12
13
11
QE
A = LOW
B = Hi.


Pr°B-1
A
23
24
B
25
T2
A
36
A
37
BEP
38
B
B



PROB. 2

DIMENSION
BOARDS FOR
CLOSER FITTINGS

ZOOM BOAR
CONNECTOR

~~MASTER CLEAR~~
~~PROBLEM - RESETS~~

ATT/SMATT AND
~~REMOTE SELECT.~~

~~KEYBOARD FRAME~~
~~SWITCH~~ SUP

ALEAT SOMESET
PAPER [illegible]
FOR ~~2~~
CHIPS

I C. SOMED

~~PLEASE [illegible] ICE~~

~~ADD [illegible]~~

EDIT / [illegible]

ALGAT SCHMIT
PIPE ~~[illegible]~~
FOR ~~[illegible]~~
CHIPS

~~I C SOCKETS~~

~~POWER FOR ICE~~

~~ADD [illegible]~~

EDIT / [illegible]

③

✓S1 = 1-2 1
✓S2 = 1-3
✓S3 = 1-4
✓S14 = 1-5
✓S15 = 1-6
✓S27 = 1-7
✓S28 = 1-8
✓S39 = 1-9
✓S40 = 1-10 9

①

✓S4 = 2-3 10
✓S5 = 2-4
✓S16 = 2-5
✓S17 = 2-6
✓S29 = 2-7
✓S30 = 2-8
✓S41 = 2-9
✓S42 = 2-10 22

⑨

✓S6 = 3-4 21
✓S7 = 3-5
✓S18 = 3-6
✓S19 = 3-7
✓S31 = 3-8
✓S32 = 3-9
✓S43 = 3-10 13
✓S44 = 3-13
✓S49 = 3-11

⑧

✓S8 = 4-5 34
✓S9 = 4-6
✓S20 = 4-7
✓S21 = 4-8
✓S33 = 4-9
✓S34 = 4-10 31
✓S45 = 4-13 42
✓S46 = 4-12 41

⑦

✓S10 = 5-6 43
✓S11 = 5-7
✓S22 = 5-8
✓S23 = 5-9
✓S35 = 5-10
✓S36 = 5-11
✓S47 = 5-12
✓S48 = 5-13 50

⑦

✓S12 = 6-7 51
✓S13 = 6-8
✓S24 = 6-9
✓S25 = 6-10
✓S26 = 6-11
✓S37 = 6-12
✓S38 = 6-13 57

✓S ~~55~~ 51 = 2A - 5
✓S ~~56~~ 52 = 2A - 6
✓S ~~57~~ 53 = 2A - 7
✓S ~~58~~ 54 = 2A - 8
✓S6 51 = 2A - 9

✓S ~~59~~ 55 = 3A - 10
X ✓S ~~60~~ 56 = 3A - ~~5~~ 8
✓S62 58 = 3A - 12
✓S6 ~~3~~ 2 = 3A - 13
✓S6 ~~1~~ 3 = 3A - 11

✓S ~~61~~ 57 = 4A - 10
✓S ~~63~~ 59 = 4A - 7
✓S ~~64~~ 60 = 4A - 8
✓S6 5 = 4A - 9
X ✓S6 ~~X~~ 5 = 4A - ~~5~~ 11

✓S7 ~~3~~ 9 = 1A - 9
✓S7 30 = 1A - 8
✓S7 81 = 1A - 10
✓S73 76 = 1A - 11
✓S ~~72~~ 83 = 1A - 13
✓S ~~75~~ 7L = 1A - 12

✓S ~~76~~ 95 A = 2A - 11
✓S ~~76~~ B = 2A - 10 } REMOTE A/B

AM ✓S ~~77~~ 87 -ATT. = 3A - 7
X ✓S77 -UNA- = 3A - ~~X~~ 4 } ATT. UNATT.
AM 87

S54 0 -UP = 6A - 3
S5X 0 -DN = 6A - 4 } REPEAT

S ~~84~~ 72 -UP = 5A - 4
S ~~84~~ -DN = 5A - 3 } EDIT

✓ S 57~~8~~ 7 = 5A — 13
✓ S 580 75 = 5A — 12
✓ S 58~~2~~ 73 5A — 11
✓ S 8~~5~~ 72 5A — 10
✓ S ~~87~~ 6? — 5A — 9
✓ S 8~~4~~ 66 — 5A — 8

✓ S 7~~9~~ 8 = 6A — 13
✓ S 8~~1~~ 76 — 6A — 12
✓ S 83 75 6A — 11
✓ S ~~86~~ 71 6A — 10
✓ S ~~88~~ 69 6A — 9
✓ S ~~90~~ 67 — 6A — 8

3A - ~~5~~ 8 = 556

5A - 3 = 572 - EDIT.

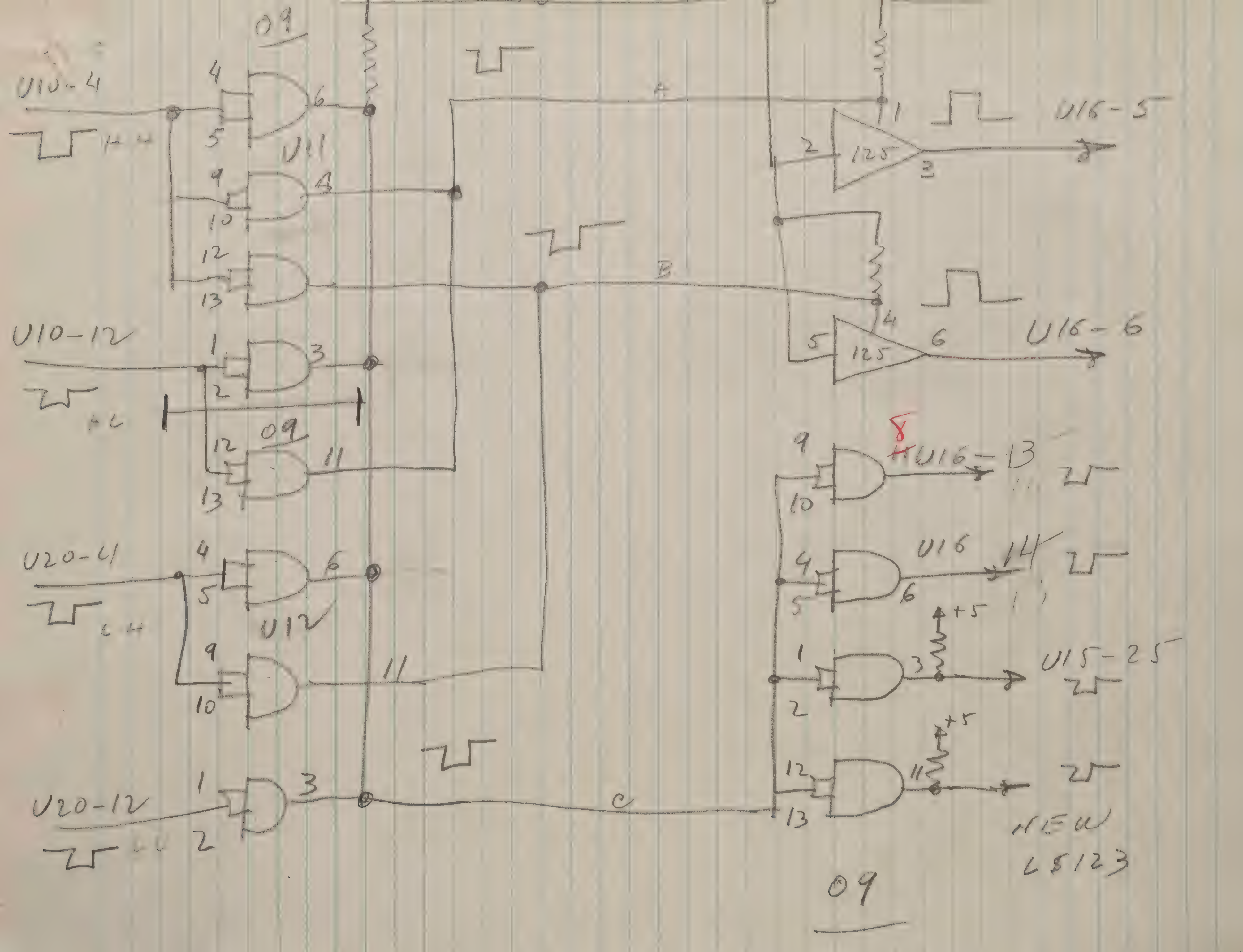
4A - ~~6~~ 11 = 565

6A - 4 = 550

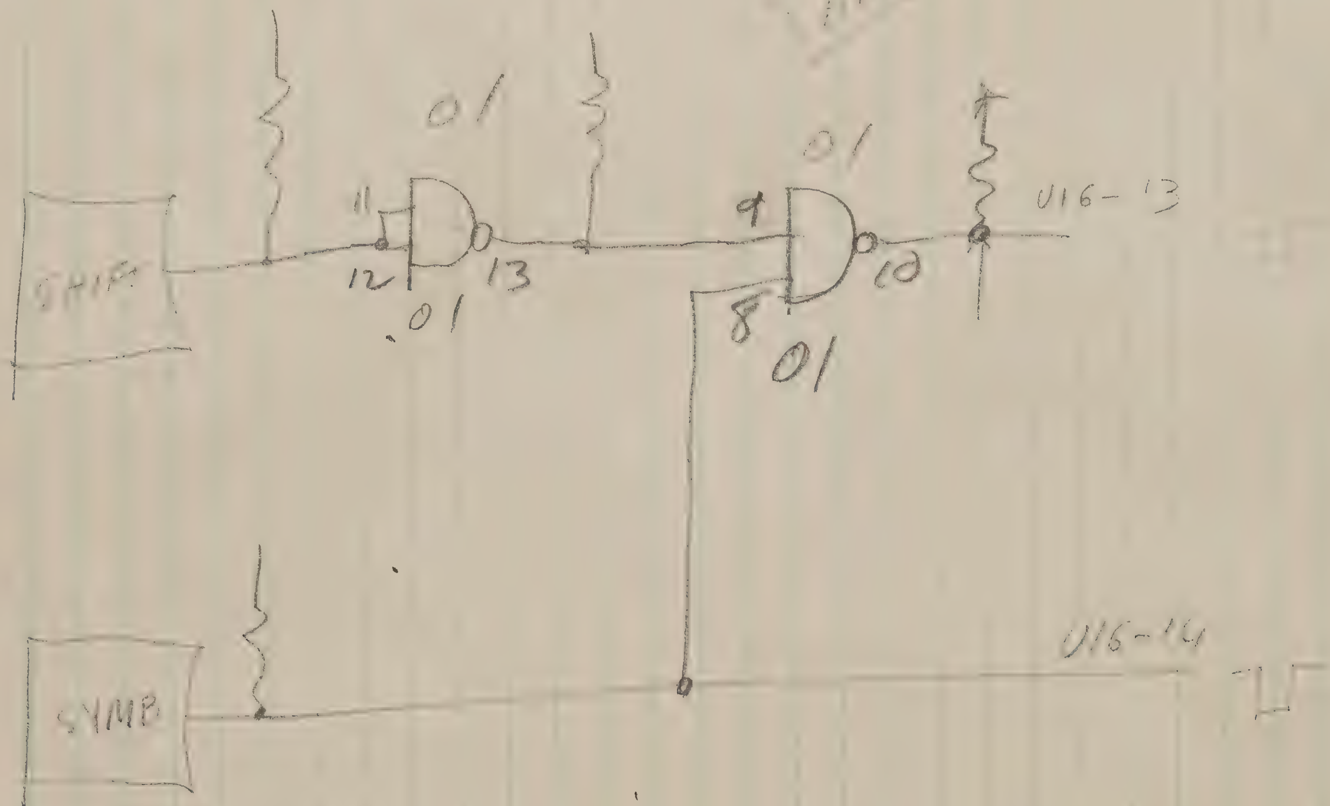
3A - ~~6~~ 9 = 587 - ATT/ON -

6A - 3 = 550 - RE-

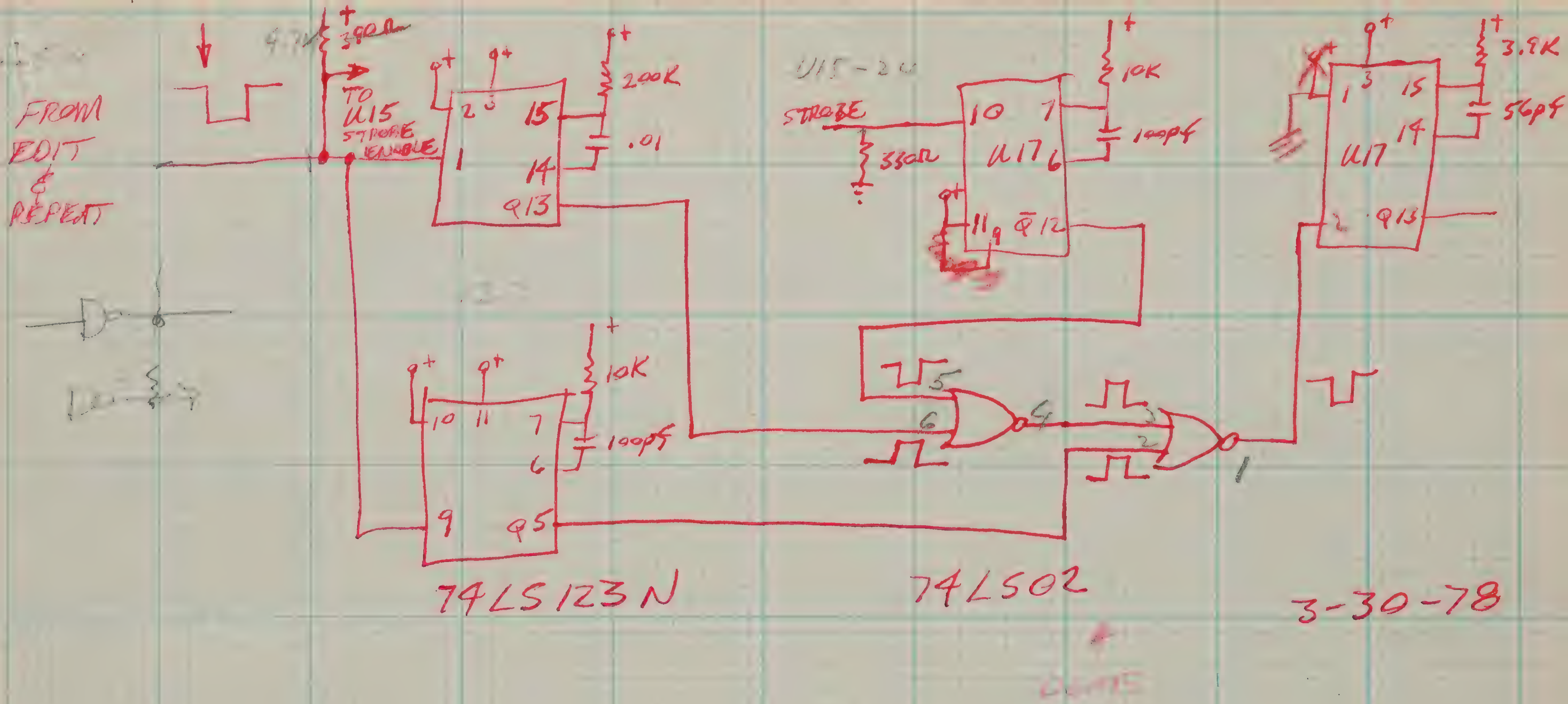
DOUBLE



U10-4
U10-12
U20-4
U20-12
09
U11
U12
A
B
C
125
U16-5
U16-6
U16-13
U16
14
U15-25
+5
NEW
LS123



DONE


FROM EDIT & REPEAT
4.7K
390Ω
TO U15 STROBE ENABLE
200K
.01
10K
100pf
74LS123N
U15-2U
STROBE
330Ω
U17
10K
100pf
74LS02
U17
3.9K
56pf
3-30-78

EDIT	DN	U10	$-4\ (\bar{Q})$
	UP	U10	$-12\ (\bar{Q})$
RESET	DN	U20	$-12\ (\bar{Q})$
	UP	U20	$-4\ (\bar{Q})$

IC SOCKET HOLES ~~.031~~ = .035

MICROSWITCH AML SWITCH [illegible] = .035

MOLEX CONN. .063

3M CONN - .035

T.O. 66 MOUNTING HOLES [illegible]

BOARD SIZE .094

2 OZ. COPPER

PCB-1 — 1.062

.035 ALL HOLES

PCB-2 MATE

J1 — 3M — 3495 - 2003 - 3417 - [illegible]
J2 — 〃 3495 - 2003 - 3417 -
J3 — 〃 3495 - 2003 - 3417 - (3)
J4 — 〃 3492 - 2003 - 3421 - (6)

J5 - MOLEX - 09-60-1101 — 09-50-7101 [illegible]
J6 — 〃 09-60-1161 — 09-50-7081 (2) [illegible]
J7 — 〃 09-60-1161 — 09-50-7081 (2) (16)
J8 — 〃 09-60-1081 — 09-50-708P (5)
J9 — 〃 09-60-1051 — 09-50-705P (5)

J10 — R N - ICL-143-56-T — 3M - 34[illegible] -
J11 — 〃 ICL-163-56-T — 3M - 3416 -

J12 - MOLEX - 09-18-5121 — 03-09-1122 (12)
J13 - 〃 09-60-1021 — 09-50-7021 (2)

CRIMP TERMINALS

✓ MOLEX — 08 [illegible] [illegible]
〃 — 02-09-1118 — (1331-5) [illegible]
〃 — 02-09-2118 (1150-P) (1)

IC - SOCKETS

14 PINS — ICL-143-56-T — 12
16 PINS ICL-163-56-T — 14
18 PINS ICL-183-56-T — 2

BOOM

MATE

J1 - 3M - 3492 - 2003 - 3421 — (?!

IC SOCKETS

14 PINS - ICL - 143 - 56 - T 2
16 " ICL - 163 - 56 - T 2
18 " ICL - 183 - 56 - T 1

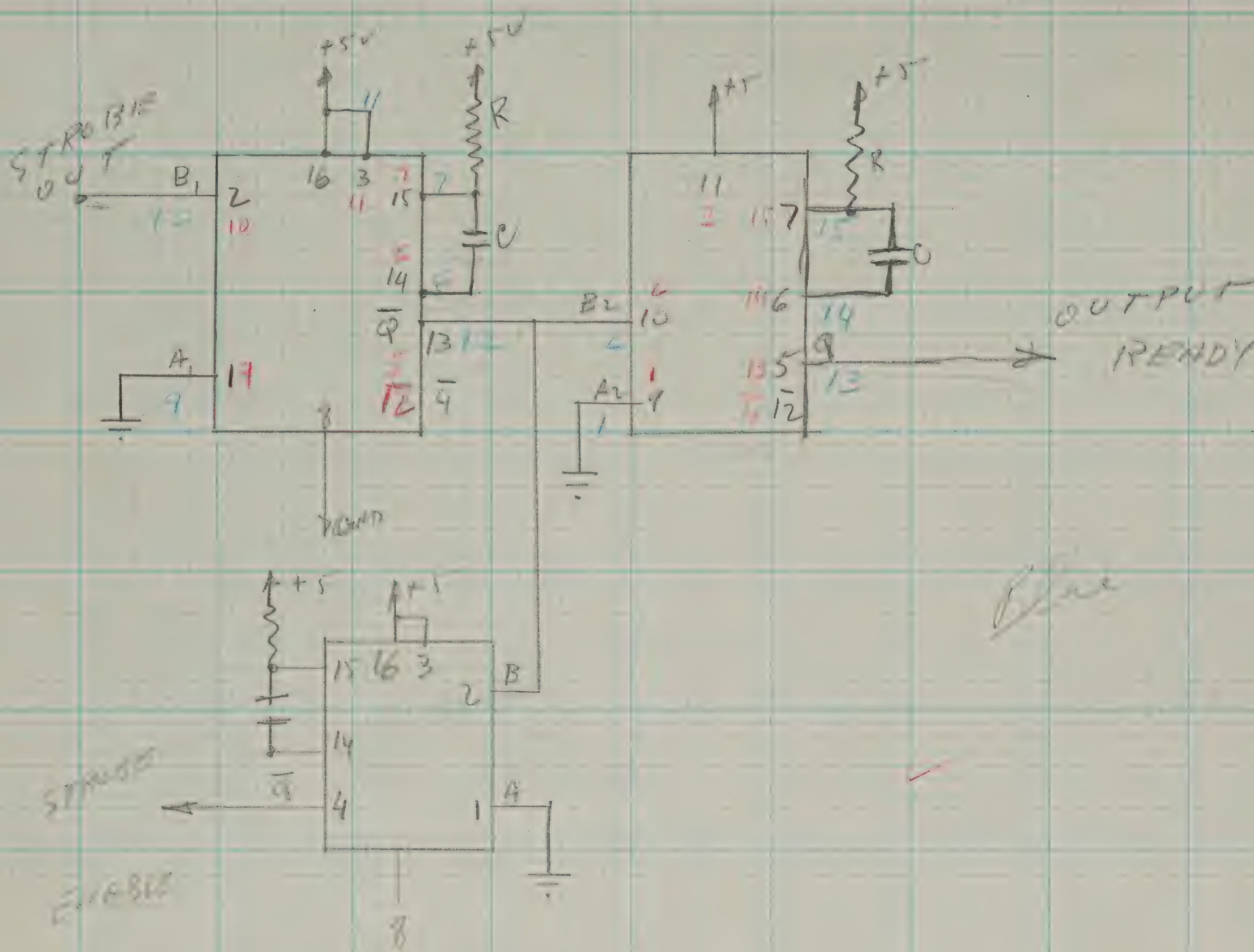
PCB - 1

MATE

J1 — 14 PINS - ICL - 143 - 56 - T - 3M - 3406 -
J2 — 16 PINS - ICL - 163 - 56 - T - 3M - 3415 -

IC SOCKETS

14 PINS ICL - 143 - 56 - T - 10
16 PINS ICL - 163 - 56 - T - 5
24 PINS - ICL - 246 - 57 - T - 1
28 PINS - ICL - 286 - 57 - T - 1


STROBE OUT
OUTPUT READY
STROBE
ENABLE
+5V
R
C
B1
A1
B2
A2
B
A
Q̄

20
7
4

31

5/8

J12 = 1, 2, 3 = +28

4, 5, 6, 8, 11 = GND

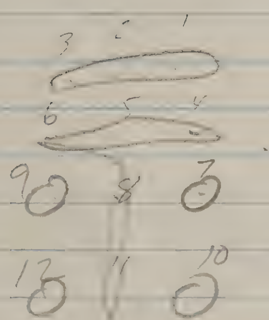
was 4 7 = (REMOTE A) = B

was 7 9 = +5V

was 12 10 = (REMOTE B) = C B

was 10 12 = -12V

+ 3 - 7 } REMOTE
- 6 - 5



PCB-1 | PCB-2

U2/2	— J2-1	~~8~~ 16	J11-1	—	U28/6
N.C.	11-2	7 15	11-2	—	NC
U2/5 —	-3	6 14	3	—	U28/3,4,5
+5	-4	5 13	4	—	+5
GND	-5	4 12	5	—	GND
R9-	-6	3 11	6	—	J3-39 (MCLR)
NC	-7	2 10	7		NC
U2-12	-8	1 9	8	-	U27-11,4,5
U2-9	-9	16 8	9	-	U27-8,12,13
-12	-10	15 7	10		-12
MCLR { GND —	-11	14 6	11	—	GND } MCLR
GND —	-12	13 5	12	—	GND
GND —	-13	12 4	13		-GND
+5	-14	11 3	14	—	+5
N.C	-15	10 2	15		N.C
COPY SW.	-16	9 1	16		U28-4,10

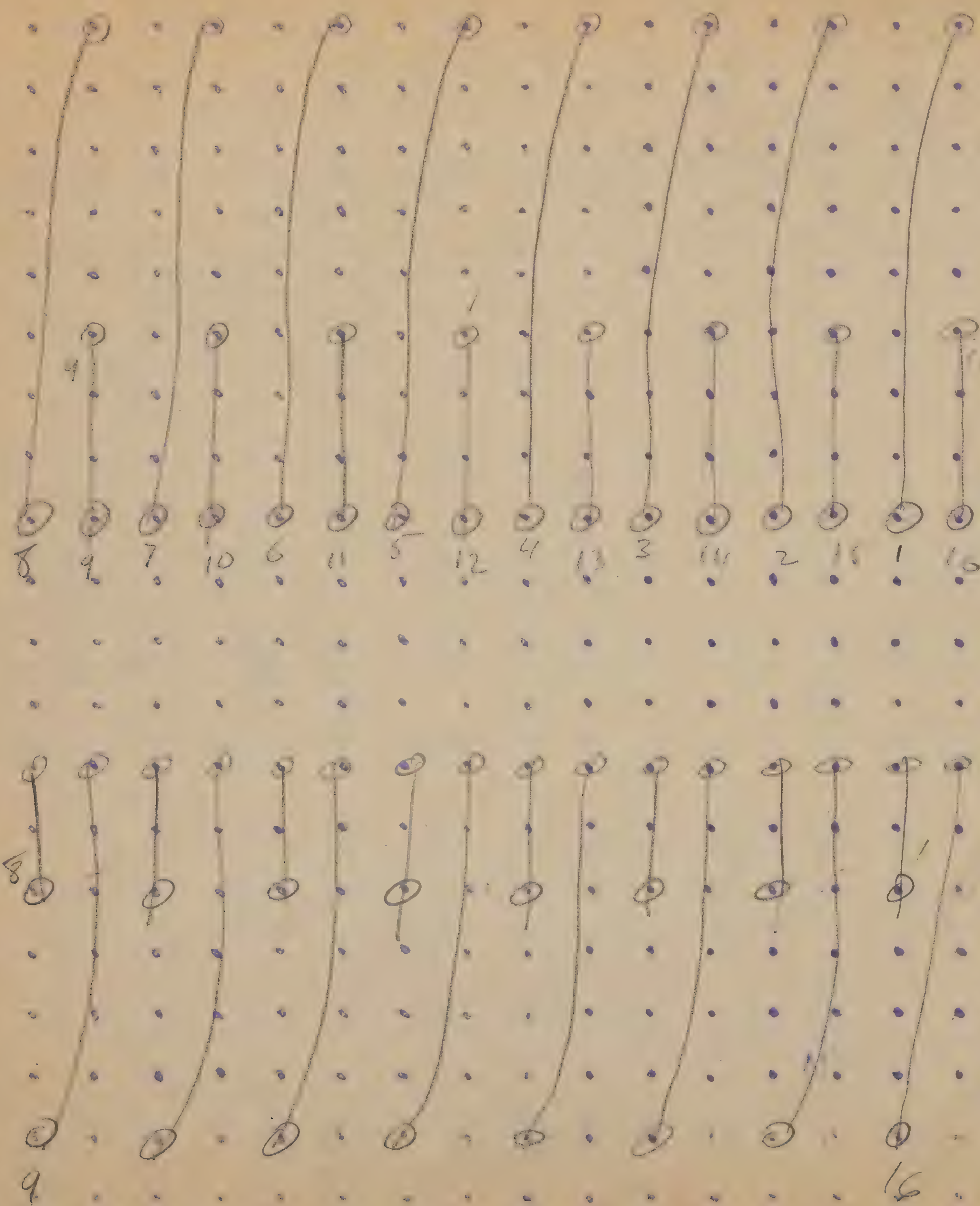
COPY	J2-1 ✓	—	J11-1 ✓	U28-9,10
-12	2 ✓		2 ✓	-12
+5	3 ✓		3 ✓	+5
N.C	4 ✓		4 ✓	N.C
GND	5 ✓		5 ✓	GND
GND	6 ✓		6 ✓	GND
MCLS.	7 ✓		7 ✓	MCLR
U2-12	8 ✓		8 ✓	U27-[illegible]
GND	9 ✓		9 ✓	GND
GND	10 ✓		10 ✓	GND
GND	11 ✓		11 ✓	GND
U2-9	12 ✓		12 ✓	-U27-8,12,13
+5	13 ✓		✓ 13	- +5
U2-5	14 ✓		✓ 14	- U28-3,4,5
N.C.	15 ✓		✓ 15	- NC
U2-2	16 ✓		✓ 16	- U28-6

PCB-2		PCB-1		PCB-1		PCB-4
J1-1	—	U18-7	—	J1-9	—	J10-9
2	—	" -5	—	J1-5	—	J10-5
3 ✓	—	" -3	—	J1-10	—	J10-10
4 ✓	—	" -11	—	J1-2	—	J10-2
5 ✓	—	" -9	—	J1-11	—	J10-11
6 ✓	—	U19-9	—	J1-3	—	J10-3.
7 ✓	—	U19-11	—	J1-12	—	J10-12
8 ✓	—	U19-7	—	J1-4	—	J10-4
9 ✓	—	GND	—	J1-13	—	J10-13
10 ✓	—	U19-13	—	J1-1	—	J10-1
11 ✓	—	GND.	—	J1-14	—	J10-14

4.22
1.000
―――
5.22
2.00
―――
3.~~1~~6
.34

3.55
2
―――
5.55

PCB-1			PCB-2
GND	J1-1 – 14	J10-1	J1-11
GND	2 – 13	2	J1-9
~~U19-11~~	3 – 12	3	J1-7
U18-9	4 – 11	4	J1-5
U18-3	5 – 10	5	J1-3
U18-7	6 – 9	6	J1-1
N.C	7 – 8	7	NC
N.C	8 – 7	8	N.C
N.C	9 – 6	9	N.C
U18-5	10 – 5	10	J1-2
U19-7	11 – 4	11	J1-8
U19-9	12 – 3	12	J1-6
U18-11	13 – 2	13	J1-4
U19-13	14 – 1	14	J1-10


8 9 7 10 6 11 5 12 4 13 3 14 2 15 1 16
9
16
PCB-1

11

7

6

11

Gus

INTERSTATE ELECTRONICS CORPORATION
SUBSIDIARY OF ATO

707 E. Vermont Ave., P.O. Box 3117, Anaheim, CA 92803 (714) 772-2811

DWG. NO. 684-006 REV. -

IDENT CODE 07421	REV. AUTH. E00082666	DATE 06/03/77	TITLE CONT PNL ASSY

SHEET COUNT 29 UNITIZED DOCUMENT AUDIT REPORT RUN DATE 05/31/77

DRAWING SIZE A ***** DRAWING (DW) ***** RUN NO. 1103

	NAME	TITLE	DATE
REQUESTED	LEARY F.M.	STAFF ELEC ENG	05/27/77
DRAWN	HUELSON P.	ASSOC ENGINEER	05/27/77
CHECKED	OESTREICH G.E.	DWG CHECKER	05/27/77
APPROVED	LANGORD J.V.	ENGRG SEC SUPVR	05/27/77

***** ASSOCIATED LISTS *****

FOR APPLICABLE PARTS LIST, DATA LIST AND SYMBOL REFERENCE LIST SEE -

DRAWING NO.	REV-LTR	DATE	DESCRIPTION	ID-CD
PL***NONE***				
DL***NONE***				
SR***NONE***				

***** DRAWING REVISIONS *****

REV LTR	REV AUTH INCORPD	PROJ NO.	EFFECT	DISP	DATE INCORPD	REVISED BY	ORGN
-	E00082666	870	RELEASE	DWG	05/31/77	CLARK G.M.	4730

***** OUTSTANDING DRAWING EO'S *****

REV LTR AFF	(EO) REV AUTH OUTSTAND	PROJ NO.	EFFECT	DISP	DATE RELEASED	PROJECT APPROVED BY	ORGN
***NONE**							

***** DRAWING APPLICATION *****

JOB USED ON NEXT ASSEMBLY	CONTRACT NO. NEXT ASSEMBLY	JOB DESCRIPTION NEXT ASSEMBLY	NEXT ASSEMBLY
NONE			

OLD NC

DOC. CONTROL
JUN 8 1977
RELEASED PRINT

DWG. NO. 684-006	TITLE CONT PNL ASSY	RLSE	REL'D	SHEET 1 OF 1

REVISIONS

FOR DRAWING REVISION STATUS SEE UNITIZED DOCUMENT AUDIT REPORT (UDAR)

LTR	DESCRIPTION	DATE	APPROVAL
—	[illegible]	[illegible]	[illegible]

INTERSTATE ELECTRONICS CORPORATION

NEXT ASSY | REQ'D | USED ON

APPROVED FOR STRATEGIC SYSTEMS PROJECT OFFICE

BY DIRECTION

SIZE	CODE IDENT NO	
A	07421	

SCALE | REV IN FILE DATE

TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

1.0 SCOPE

This specification defines the requirements for the SEA WATCH Analyst Console Control Panel Assembly.

2.0 APPLICABLE DOCUMENTS

2.1 GOVERNMENT REFERENCE DOCUMENTS

MIL-STD-1280	28 January 1969
MIL-STD-188C	Notice 1, 1 June 1976

Note that it is not required that the control panel assembly meet these military standard specifications. These MIL-STD documents may be used as a common point of reference for functional operations.

2.2 GOVERNMENT COMPLIANCE DOCUMENTS

MIL-STD-454	Requirement 1 (Safety)
MIL-STD-454	Requirement 5 (Soldering)
MIL-STD-454	Requirement 9 (Workmanship)

2.3 APPENDIX A

Portions of Attachment B, which in turn is a portion of the modified O.D.S.I. proposal to the Navy, are given in Appendix A.

3.0 REQUIREMENTS

3.1 MECHANICAL

The control panel assembly to be furnished by the supplier is shown in Figures A and B.

The keyboard panel, trackball panel, and ashtray/cupholder panel are supported by a turret structure as shown in Figure A. Interstate will provide the empty turret structure to the control panel assembly supplier. The supplier shall supply to Interstate the completed control panel/turret assembly.

All associated encoding electronics provided with the control panel are to be contained within the turret, preferably integral with the removable panels. Three flat belt ribbon cables with provisions for 40 pins of signal input/output will be provided up to the panels by Interstate. Only the male portions of the signal connectors shall be provided with the panels by the control panel supplier. In addition to the signal connectors, a terminal strip for power connections must be supplied by the keyboard vendor. Connection to the Interstate console will be made by Interstate.

All panels shall be independently removable for servicing through the use of appropriate mechanical fasteners, connectors and service loops where required. Also, the trackball panel and ashtray/cupholder panel shall be interchangeable, allowing for left handed operation of the trackball.

[illegible] will furnish to the control panel assembly supplier (1) detailed outline and mounting drawings of the empty turret structure within 4 weeks of award of contract, and (2) empty turret structures within 12 weeks of award of contract.

The supplier shall prepare, and retain for future reference, all detail and assembly drawings, parts lists and other documentation (except the turret structure drawing) necessary to document the design and fabrication of the control panel assembly, using the supplier's own document forms and commercial standards. Military specification documentation is not required.

3.2 ELECTRICAL REQUIREMENTS

The following is a discussion of the electrical characteristics required of the systems control keyboards:

Electrically, the keyboard output shall be divided into four groups: (1) the conversational and special keyboard, (2) the fixed function keyboard, (3) the changeable function keyboard, and (4) the zoom control keyboard. Unless otherwise stated all inputs and outputs to the keyboard shall be assumed to be fully TTL compatible, a HIGH or 1 meaning +2.4 volts (minimum), and a LOW or Ø meaning +.4 volts (maximum).

The conversational and special keyboard code shall be modified USASCII, while the fixed function, the changeable function, and zoom control keyboards, as well as the keyboard lighting, shall be straight binary or binary coded decimal (BCD). First the ASCII keyboard group will be discussed.

3.2.1 Conversational and Special Keyboards (Modified ASCII)

Figure C is the proposed modified ASCII keyboard. One bit shall be defined to provide a special symbol shift for the special symbols shown in superscripts on the keys of the Conversational Keyboard. This bit shall be controlled by the "SYM" (Symbol Shift) key. With the depression of the normal "SHIFT" or "SHIFT LOCK" keys the normal shift to the seven bit ASCII code of the superscript shall occur, with the exception of the 26 capital letters of the alphabet. The upper case alphabet character codes must be presented in both the shifted and unshifted modes.

In the normal shift mode the symbol shift bit will remain at its normal LOW (Ø) level. With the depression of the "SYM" shift key, all of the normal ASCII shift codes are generated and the symbol shift bit goes from a LOW (Ø) to a HIGH (1). Thus, any seven bit ASCII character code preceded by a one in the symbol shift bit will characterize a symbol. If the "SHIFT" or "SHIFT LOCK" keys are depressed concurrently with the "SYM" shift key, a 1 shall still be placed in the symbol shift bit and the code will be that of a symbol. The symbol shift bit simply adds an extra dimension to the seven-bit ASCII character code.

The proposed character codes and their representations are shown in table 1. Note that two codes are required for both the "EDIT" and "REPEAT" keys, one code for the depression and one for the release. Also note that there will be two encoded rocker switches: the ATTEND/UNATTEND switch and the REMOTE SELECT A/B Switc[illegible]

The Conversational and Special Keyboard (modified ASCII) shall be capable of 2-key rollover. The key caps must be a dark shade, with considerable preference given to dark brown, to minimize a soiled appearance after long periods of continuous use. Normal ASCII characters shall appear in white, and the special symbols as well as the "SYM" mnemonic on the symbol shift keys caps shall appear in yellow in their respective positions on the key caps.

The output data lines for the Conversational and Special keyboard shall be taken off edge connector A as shown in table 2. After each key depression (and release for the EDIT and REPEAT keys) that key's code must be held at the keyboard output and a data Output Ready Signal must be generated. The Conversational Output Ready Signal shall be a single pulse of width 150 ±50ns whose positive going edge must occur 100 ns (min) after the output data becomes available. The data must be held for a minimum of 200ns following the positive going edge of the Conversational Output Ready Signal. This data can be held until the next data transfer is required. See figure D for data output timing.

3.2.2 Straight Binary and Binary Code Decimal (BCD) Keyboards
The two function keyboards and the zoom keyboard are the straight binary and BCD keyboards. Two-key rollover for these keys is required. That is, with the depression of a first key the depression of a second key will not be recognized until the release of the first key.

3.2.2.1 The Fixed Function Keyboard - The Fixed Function Keyboard will be located in the upper center portion of the system console as shown in figure B. From right to left the keys shall be encoded zero through fifteen (decimal) (ØØØØ-1111 binary). The output lines from the Fixed Function (FF) keyboard shall be placed on edge connector A as shown in table B. The Fixed Function keys shall be momentary action switch/indicators with fixed black legends and externally controlled background indicators.

With each key depression the keyboard interface must supply bits FFØ-FF3 (the key code), and a Fixed Function Output Ready Signal (FFORS). The FF Output Ready Signal shall have the same electrical characteristics as the Conversational Output Ready Signal. See figure D for data output timing.

The background indicators on the Fixed Function keys shall be turned on and off externally. Each key shall have its own address. Table C lists a possible addressing scheme for the fixed function keys. With each key address a "Key ON/OFF" bit shall be set or cleared (1 or Ø) and the background indicator must be turned ON (amber) or OFF (cyan) respectively. A great deal of preference is given to the cyan background color in the off mode. However, if investigation shows that a cyan background is not feasible, colors from cyan to shades approaching green are acceptable. Data input timing shall be discussed in section 2.4. All incandescent bulbs must be supplied with a preheat current in the "OFF" mode to minimize current spikes associated with a sudden potential difference across a cold filament.

With the initial power on sequency background indicators must come up in the cyan (OFF) state. After a key is depressed and the code is output, the external device shall address that key and its background will be changed from cyan (OFF) to amber (ON). Sometime later, that key will again be addressed and its background will be changed from amber to cyan thereby completing a cycle.

The desired intensity of the output of each lighted key is such that the information displayed is clearly visible at a distance of five to six feet without being a distraction to the operator working under ambient lighting conditions of approximately forty foot lamberts.

3.2.2.2 Changeable Function Keyboard - The Changeable Function Keyboard and its thumbwheel shall be located in the upper center portion of the system control panel as shown in figure B. Each Changeable Function Key shall be a momentary action switch/indicator capable of displaying ten different white legends on two background colors. Interstate shall supply the switch modules with the appropriate legends The vendor shall mount modules and provide the necessary wiring and encoding. From right to left the key outputs shall be encoded zero through fifteen (decimal) (ØØØØ-1111 binary). The thumbwheel output shall be a binary coded decimal (BCD) type output that must be held on edge connector A at all times.

With the depression of a key that key's code, the thumbwheel setting, and a Changeable Function Output Ready Signal (CFORS) must be supplied on edge Connector A. The electrical characteristics of the Changeable Function Output Ready Signal shall be the same as the Conversational Output Ready Signal. See figure D for data output timing.

The background indicators for the changeable function keys shall be turned OFF and ON externally exactly as the background indicators for the fixed function keys. Table 3 lists possible indicator addresses for the Changeable Function keys. Again, the background code shall be cyan for OFF and amber for ON. The color and intensity of the backgrounds for these keys must come as close as possible to matching the background for the Fixed Function Keys.

The thumbwheel setting for the Changeable Function Keyboard must dictate the legends of the Changeable Function Keys as well as provide the outputs discussed above. There shall be ten different legends for each key corresponding to thumbwheel setting are listed in table 4. These legends shall appear in white on the aforementioned backgrounds.

3.2.2.3 Zoom Control - The Zoom Control keyboard shall be located in the upper right-hand (or left-hand for a left-handed console) corner as shown in figure B. The Zoom Control keyboard shall consist of ten binary coded decimal keys (Ø-9), and a "ZOOM" key. With each key depression the code of the key being depressed and a "Zoom Output Ready" signal must be presented at the output edge connector (see table 2). The "Zoom Output Ready Signal" shall have the same electrical characteristics as the Conversational Output Ready Signal with respect to the Zoom keyboard. The "ZOOM" key code can be any four-bit code other than the binary coded decimal (Ø-9) to be used for the other ten keys.

3.2.2.4 Trackball - The Trackball shall be located in the upper right-hand corner of the system console next to the zoom control keyboard as shown in figure B. Four lines from the trackball output shall supply TTL pulses whose frequencies are to be directly proportional to the angular velocity of the Trackball. The output shall be encoded as squarewaves at normal TTL voltage levels. The outputs shall appear on edge Connector B as shown in table 5.

There shall be 300 pulses per 360° of Trackball revolution. The Trackball shall be approximately three inches in diameter. It is desired that the Trackball be optically encoded to optimize longevity of operation.

Interstate shall supply the trackball unit with the basic encoding elements as described. The vendor shall mount the trackball unit and provide the necessary cables and interconnection for operation.

3.2.3 <u>Additional Indicators and/or Switches</u>
Additional switch/indicators not mentioned above are:

a. Row of 16 indicator lamps.

b. The A or B monitor indicator.

c. The POWER ON Switch indicator.

d. BUSY and ALERT indicators.

e. The CURSOR CENTER switch.

f. The ATTENDED/UNATTENDED switch/indicator.

g. the REMOTE ENABLE, the REMOTE SELECT A/B, and the PLOT switches.

h. Audible alarm.

3.2.3.1 <u>Row of 16 Indicator Lamps</u>. - There shall be a row of 16 indicator lamps just above the 16 fixed function keys and below the changeable function keys as shown in figure B. These indicators shall be addressed and turned ON or OFF just like the function key indicators; however, there will be only one bulb in these indicators to be turned either OFF or ON. Again, a possible addressing scheme is given in table 3. Each of these indicator lamps shall have a distinct mnemonic displayed in black on its cap. These mnemonics will be supplied at a later date. The indicators shall be amber colored when ON. With the initial power-on sequence, these indicators must come up in the OFF mode (unlit).

3.2.3.2 <u>The A or B Monitor Indicator</u>. - The A or B monitor indicators shall be located on a remote panel between the CRT displays. This panel will be supplied by Interstate. The displays of these indicators shall be large cyan arrowhead-like projections as shown in figure B.

The monitor indicators may be addressed as shown in table 3. Just as the row of indicators, these keys shall be addressed and turned ON (cyan) by placing a 1 in the key ON/OFF bit or OFF by setting this bit to Ø.

3.2.3.3 <u>The POWER ON Switch Indicator</u> - The POWER ON switch/indicator shall also be located on the special panel between the monitors between the A or B monitor indicators. The POWER ON indicator shall be a cyan horizontal bar between the monitor indicators. Together the POWER ON indicator and a monitor indicator shall form an arrow, the POWER ON indicator being the shaft and the monitor indicator being the arrowhead.

The vendor shall light this indicator whenever the control panel assembly receives a regulated +5VDC from the system power supplies supplied by Interstate.

The module must be supplied in an assembled package with all components necessary to display the indicated projection.

The switch mechanism must be an alternate action, two pole, double throw swtich capable of switching 2 amperes at 24 volt. Interstate will make the final connection to this switch mechanism.

3.2.3.4 The BUSY and ALERT Indicators - The BUSY and ALERT indicators are located just above the Conversational keyboard as shown in figure C. The BUSY and ALERT mnemonics shall appear in black legends on the indicator caps. These indicators shall be turned ON or OFF exactly like the indicators in the row of 16 indicators and the monitor indicator. Addresses for the BUSY and ALERT indicators are given in table 3. Either the BUSY or ALERT indicator will be addressed and its background will be turned ON (red) or OFF (unlighted).

3.2.3.5 The HOME Switch - The HOME switch (see figure B) shall be a momentary action type switch. With each depression its output shall be a code with the same characteristics as a ZOOM Keyboard output. This code output shall be made available on edge Connector A as shown in table 2. The code for this key can be any four bit code other than the codes used for the ZOOM Keyboard.

3.2.3.6 The ATTENDED/UNATTENDED Switch/Indicator - The ATTENDED/UNATTENDED switch/indicator shall be an alternate action switch/indicator. It shall be centered above the Conversational Keyboard as shown in figure C. The coded outputs for the alternate depressions of this key are given in table 1 with the Conversational and Special Keyboard outputs. The output is to be treated as a conversational type output. A Conversational Output Ready Signal must be generated. The indicator shall be lighted amber in the ATTENDED position and lighted cyan in the UNATTENDED position.

3.2.3.7 The REMOTE ENABLE, the REMOTE SELECT A/B and the COPY Switches - The REMOTE ENABLE, the REMOTE SELECT A/B and the COPY switches will be located in the upper right-hand corner of the "special" keyboard just above the "Conversational" keyboard as shown in figure C. These three switches together shall control the remote video units and inform the console computer of the status of this control.

The REMOTE ENABLE switch will be a three-position rocker switch. When either the C.C.T.V position is selected or the REMOTE SCREEN position is selected, that position's given output control line must be grounded, thereby enabling the video display selected by the REMOTE SELECT A/B switch to be routed to a remote video screen and/or hard copy unit. The REMOTE ENABLE return (ground) must be isolated from the keyboard logic ground. The REMOTE ENABLE output control lines will be on edge Connector B as shown in table 5.

The REMOTE SELECT A/B switch will be an encoded rocker switch similar to the ATTENDED/UNATTENDED rocker switch but with an additional control function required. One distinct conversational type code must be sent to the console computer to signify the channel selected (one code for Channel A and another for Channel B) and an output line for the control of the selected channel must be grounded. The return for the control side of the switch must be isolated from the keyboard logic ground. The REMOTE SELECT A/B control lines will be output on edge Connector B as shown in table 5 and its coded output will go out as a Conversational output of edge Connector A.

The COPY button will be similar to the rest of the momentary action encoded keyboard switches but it too is required to perform an additional control function. When this key is depressed its code will be sent to the computer as a Conversational type output and an output control line will be grounded for the duration of the key depression. The COPY key cap has been depicted as a two switch module cover. This allows one switch module to be encoded as a Conversational type key and the other switch module to be a switch to an isolated ground for the control function. Again, like the REMOTE SELECT A/B switch, the COPY control line will be output on edge Connector B as shown in table and its coded output will go out as a Conversational output on edge Connector A.

3.2.3.2 Audible Alarm - It is required that the control panel produce an audible alarm. The addresses for this alarm is given in table 3. Each time the alarm is addressed it shall sound for a period of 250 ±50 msec. The alarm time-out period shall be retriggerable so that a continuous alarm may be sounded by repeatedly addressing the alarm within periods of 200 ms. The audible device shall be a Mallory SNP428 alarm or equivalent. Placement of audible device shall be recommended and upon approval of Interstate be carried out by the control panel assembly supplier.

3.2.4 Data Input Timing

3.2.4.1 POWER ON and the ATTENDED/UNATTENDED Switch/Indicators - As has been discussed earlier all indicators with the exception of the POWER ON and the ATTENDED/UNATTENDED switch/indicators shall be controlled by a device external to the control panel complex. Each of the externally controlled indicators was given an address. These addresses are listed in table 3. Input timing information must now be supplied.

The address codes I_1 - I_6, as given in table 3, shall be supplied by the external device to the keyboard via edge Connector C as shown in table 6. The shortest interval between new address codes shall be no less that one computer instruction time, or approximately 10 μs. With the exception of this pulse repetition interval minimum, the characteristics for the New Data Ready (NDRDY) signal shall be the same as the Output Ready Signal. With each new address presented a New Data Ready signal shall be supplied by the external device to the keyboard complex via edge Connector C as shown in table 6.

In order to facilitate design and to insure Interstate's adaptability to the keyboard interface, an addressable latch scheme to decode and hold the given inputs is shown in figure 6.

3.2.4.2 Master Clear - A Master Clear pulse, "$\overline{\text{MCLR}}$", shall be supplied by the external device to initialize all keyboard logic functions. This Master Clear pulse shall be input on Connector C as shown in table 6. The signal is processor generated and its characteristics are yet to be defined.

3.2.5 Power

3.2.5.1 Overall System - As was mentioned in section 1.0, the keyboard vendor must provide a terminal strip for power input. Interstate will supply ±12 volts and +5 volts, all at approximately 5 percent regulation, to be used for keyboard logic supply. Further, there will be an unregulated +5 volts supplied that is to be used to drive all addressable indicator lamps and the indicator lamps for the legends on the Changeable Function keys.

The keyboard vendor shall supply a worst case current drain and a typical current drain within four weeks after award of contract for each of the aforementioned voltage levels that the vendor elects to use. Further, if at any time the vendor feels that there will be additional voltage requirements these requirements must immediately be brought to the attention of Interstate's personnel.

3.2.5.2 Logic Family - Wherever availability, speed, and drive considerations will permit, it is desired that all logic elements be of the low power Schottky TTL family.

3.3 MATERIALS

Corrosion resisting materials and finishes shall be utilized wherever practical. Metal-to-metal contact of dissimilar metals shall be governed by the criteria of MIL-E-16400. Fungus nutrient materials, mercury, and radio active materials shall not be used in any form.

3.4 NAMEPLATES AND PRODUCT MARKING

There shall be no visible nameplates or product vendor markings.

3.5 PAINT

The control panel, ashtray and cupholder panel, and the Zoom keyboard and Trackball panel edge and front are to be painted light brown, Color Chip 26321, per FED-STD-595, Federal Specification TT-E-5029, Class B, semigloss enamel.

3.6 WORKMANSHIP

Workmanship shall be in accordance with best commercial practices consistent with vendors normal design and production techniques.

4.0 QUALITY ASSURANCE PROVISIONS

Unless otherwise specified in the purchase order, the supplier is responsible for assuring conformance to all requirements specified herein. Interstate reserves the right to perform any tests and inspections deemed necessary to assure that these requirements are met.

5.0 PREPARATION FOR DELIVERY

Each unit shipped shall be individually packaged and packed in accordance with standard commercial practices which will assure adequate protection against damage during shipment. The packaging shall conform to applicable carrier rules and regulations.

6.0 NOTES

6.1 APPROVED PARTS LIST

Item	Manufacturer	Mfg Part Number
Changeable Function Switch/Indicators	Industrial Electronic Engineers (IEE)	2200 Series Rear Projection Switch/Indicator (Interstate to supply)
Fixed Function Switch/Indicators	Microswitch Corporation	AML11GBA2AA
Row of 16 Indicator Lamps and A or B Monitor Indicators	Microswitch Corporation	AML41FBA2
Trackball	Measurement Systems Inc.	Model 628-4 (Interstate to supply)
Monitor Indicator	Microswitch Corporation	AML41CBA2
Power Switch/ Indicator	Microswitch Corporation	[illegible]

6.2 SUBSTITUTABILITY

Only those items listed in the Approved Parts List are approved by Interstate for use in the applications specified herein. A substitute item shall not be used without prior approval by Interstate Electronics Corporation.

6.3 AVAILABILITY

Identification of the approved parts herein is not to be construed as a guarantee of continued availability for the items described.

6.4 APPROVED SOURCE OF SUPPLY

Interstate Part No.	Vendor	Vendor P/N.	Description
684-006-001	Parko Electronics	101563	Remote Panel
684-006-002	Parko Electronics	101562	Keyboard Panel
684-006-003	Parko Electronics	101565	Trackball Panel
684-006-004	Parko Electronics	101564	Ashtray/Cupholder

TABLE I. CHARACTER CODES

KEYBOARD			CODE		
No Shift	Regular Shift	Symbol Shift	A No Shift	Regular Shift	Symbol Shift
Space	Space	Space	04[illegible]	040	04[illegible]
0	0	[illegible]	060	060	[illegible]
1	!		061	041	241
2	"		062	042	242
3		[illegible]	063	043	243
4	[illegible]	–	064	044	244
5		[illegible]	065	045	245
6	&	[illegible]	066	046	[illegible]
7	'	[illegible]	067	047	247
8	(	\	070	050	[illegible]
9	)	↑	071	051	[illegible]
[illegible]	[illegible]		[illegible]	052	
:	+	[illegible]	[illegible]	053	[illegible]
[illegible]				[illegible]74	[illegible]
[illegible]	=		[illegible]	075	[illegible]
.			[illegible]	07[illegible]	[illegible]
/	?	[illegible]	[illegible]	077	[illegible]77

KEYBOARD			A CODE		
No Shift	Regular Shift	Symbol Shift	No Shift	Regular Shift	Symbol Shift
@	(grave)		100	140	
A	A		101	101	301
B	B	[illegible]	102	102	302
C	C	[illegible]	103	103	303
D	D		104	104	304
E	E	[illegible]	105	105	305
F	F		106	106	306
G	G		107	107	307
[illegible]	H	[illegible]	110	110	310
I	I	[illegible]	111	111	
J	J		112	112	312
[illegible]	K		113	113	313
[illegible]	L		114	114	314
M	M	[illegible]	115	115	315
N	N	[illegible]	116	116	316
O	O		117	117	
P	P		120	120	
Q	Q		121	121	321
[illegible]	R	[illegible]	122	122	322
S	S	[illegible]	123	123	323
T	T	[illegible]	124	124	324
U	U	[illegible]	125	125	325
V	V	—	126	126	326

KEYBOARD			CODE		
			A		
No Shift	Regular Shift	Symbol Shift	No Shift	Regular Shift	Symbol Shift
W	W	[illegible]	127	127	327
X	X		130	130	330
Y	Y		131	131	331
Z	Z		132	132	332
	[illegible]	+	[illegible]3	17[illegible]	373
	|		[illegible]	17[illegible]	374
¬			[illegible]	[illegible]	
	[illegible]		[illegible]6	[illegible]	
Backspace			010		
Tab			[illegible]1		
Line Down= Line Feed			012		
Line Up			013		
Reset= Form Feed			014		
Carriage Return			015		
Delete			[illegible]7		
F0			[illegible]1		
F1			022		
F2			023		
F3			[illegible]		
[illegible]			[illegible]5		
[illegible]			[illegible]6		
[illegible]			[illegible]27		
[illegible]			[illegible]		

KEYBOARD			CODE		
No Shift	Regular Shift	Symbol Shift	No Shift	Regular Shift	Symbol Shift
[illegible]			[illegible]1		
[illegible]			0[illegible]2 S		
Send Index			[illegible]34		
Send			035		
Tab Set			[illegible]36		
Unlabeled Button			[illegible]3 D		
Screen A			134 D		
Attend			[illegible] SPECIAL - NEXT BOARD (D)		
Screen B			[illegible] R		
Unattend			1[illegible] SPECIAL - NEXT BOARD (D)		
Line Clear			[illegible]41		
Clear Screen			1[illegible]		
Clear All			1[illegible]		
Line Skip			1[illegible]5		
Skip			[illegible]		
New Line			000 D		
Copy			[illegible] D -		
Edit Down			[illegible]53 C SPECIAL		
Repeat Down			[illegible]56 C SPECIAL		
Edit Up			1[illegible] C		
Repeat Up			1[illegible]3 C		
Special 1			1[illegible]4		
Special 2			1[illegible]		

KEYBOARD			CODE		
No Shift	Regular Shift	Symbol Shift	No Shift	Regular Shift	Symbol Shift
Special 3			166		
Special 4			167		
Symbol Shift			None		
Shift			None		
Shift Lock			None		
Remote Select A			151 SPECIAL D		
Remote Select [illegible]			[illegible]		
CCTV			None		
Remote Screen			None		
REMOTE ENABLE SCREEN			NONE		
REMOTE ENABLE CCTV			NONE		

TABLE 2. CONNECTOR A

PIN NO.		SIGNAL	PIN NO.		SIGNAL
1	AS∅		21	CF2	Changeable Function Key Code
2	AS1		22	CF3	
3	AS2	7-Bit Modified ASCII Code	23	TH∅	
4	AS3		24	TH1	Changeable Function Thumbwheel
5	AS4		25	TH2	
6	AS6		26	TH3	
7	AS6		27	GND	
8	SYM	Symbol Shift Bit	28	CFORS	Changeable Function Output Ready Signal
9	GND		29	GND	
10	CORS	Conversational Output Ready Signal	30	ZOOM ∅	
11	GND		31	ZOOM 1	Zoom Key Code
12	FF∅		32	ZOOM 2	
13	FF1	Fixed Function Key Code	33	ZOOM 3	
14	FF2		34	GND	
15	FF3		35	ZORS	Zoom Output Ready Signal
16	GND		36	GND	
17	FFORS	Fixed Function Output Ready Signal	37	SPARE	
18	GND		38	SPARE	
19	CF∅		39	SPARE	
20	CF1		40	SPARE	

TB1

TB2

zoom

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TABLE 3. INDICATOR ADDRESS CODING

I_3	I_2	I_1	I_0	$I_5 = 0 \quad I_4 = 0$	$I_5 = 0 \quad I_4 = 1$	$I_5 = 1 \quad I_4 = 0$	$I_5 = 1 \quad I_4 = 1$
0	0	0	0	A Monitor	Fixed Function Key 0	Changeable Function Key 0	Indicator Lamp 0
0	0	0	1	Monitor B	1	1	1
0	0	1	0	Busy	2	2	2
0	0	1	1	Alert	3	3	3
0	1	0	0		4	4	4
0	1	0	1		5	5	5
0	1	1	0		6	6	6
0	1	1	1		7	7	7
1	0	0	0		8	8	8
1	0	0	1		9	9	9
1	0	1	0		10	10	10
1	0	1	1	Audible Alarm	11	11	11
1	1	0	0		12	12	12
1	1	0	1		13	13	13
1	1	1	0		14	14	14
1	1	1	1		15	15	15

TABLE 4. FUNCTION KEYBOARD CHANGEABLE SWITCH/INDICATOR READOUTS

Switch Indicator	Thumbwheel Switch Position 1	2	3	4	5	6	7	8	9	10
0 0 0 0	QUERY	A2	TITLE	A4	SELECT FILE	A6	A7	A8	FUNCT KEY TEST	A0
0 0 0 1		B2	B3	B4	ADD	B6	B7	B8	CURVES	B0
0 0 1 0		C2	C3	C4	CHG	C6	C7	C8	RESOLV	C0
0 0 1 1	POLAR	D2	D3	D4	DEL	D6	D7	D8	ALPHA	D0
0 1 0 0	TERR LIMITS	HST	SPFY	E4	INDEX	E6	E7	E8	KEY BOARD TEST	E0
0 1 0 1	AREA CLSRE	F2	F3	F4	F5	F6	F7	F8	LINES	F0
0 1 1 0	LAT/ LONG LINES	G2	G3	G4	G5	G6	G7	G8	FOCUS	G0
0 1 1 1	TRACK SUPPR	H2	H3	H4	H5	H6	H7	H8	TEST 1	H0
1 0 0 0	RANGE CIRCLE	BRNG WIDTH	BAR GRAPH	I4	FINISH	I6	I7	I8	DEMO	I0
1 0 0 1	TARGET UNCTY	J2	J3	J4	J5	J6	J7	J8	PARTL ERASE	J0
1 0 1 0	MODIFY	K2	K3	K4	K5	K6	K7	K8	GRAY LEVELS	K0
1 0 1 1	ERNG	L2	L3	L4	L5	L6	L7	L8	TEST 2	L0
1 1 0 0	CALC	M2	LINE GRAPH	M4	M5	M6	M7	M8	CURSOR	M0
1 1 0 1	DR	N2	N3	N4	N5	N6	N7	N8	FULL ERASE	N0
1 1 1 0	PORT/ SHIP NAMES	O2	O3	O4	O5	O6	O7	O8	GRAY UNRTY	O0
1 1 1 1	LINE	P2	P3	P4	P5	P6	P7	P8	SO [illegible] COMM TEST	P0

TABLE 5. CONNECTOR B

PIN NO.	SIGNAL	PIN NO.	SIGNAL	
1	+X, Pulse-Right Direction	21	SPARE	
2	-X, Pulse-Left Direction	22	SPARE	
3	SPARE	23	SPARE	
4	[illegible]	24	SPARE	
5	SPARE	25	SPARE	
6	+Y, Pulse FWD Direction	26	SPARE	
7	-Y, Pulse AFT Direction	27	SPARE	
8	SPARE	28	SPARE	
9	SPARE	29	SPARE	
10	SPARE	30	SPARE	
11	SPARE	31	SPARE	
12	SPARE	32	Enable Remote Screen	Remote Enable
13	SPARE	33	Remote Enable Return	
14	SPARE	34	Enable C.C.[illegible]-	
15	SPARE	35	SPARE	
16	SPARE	36	SELECT A-	
17	SPARE	37	Remote Select Return	
18	SPARE	38	SELECT B-	
19	SPARE	39	Copy Control Return	
20	SPARE	40	Copy	

zoom
1-8

SW [illegible]

SW [illegible]

TB 1

INTERSTATE ELECTRONICS CORPORATION

DOCUMENT NO.

TABLE 6. CONNECTOR C

PIN NO.		SIGNAL	PIN NO.		SIGNAL
1	IØ		21	SPARE	+5 TB3
2	I1		22	SPARE	+5
3	I2		23	SPARE	+5
4	I3		24	SPARE	
5	I4		25	SPARE	
6	I5	TB2	26	SPARE	
7	KEY O/F		27	SPARE	
8	GND.		28	SPARE	
9	NDRDY-		29	SPARE	
10	GND	10	30	SPARE	
11	SPARE		31	SPARE	+5
12	SPARE		32	SPARE	
13	SPARE		33	SPARE	
14	SPARE		34	SPARE	
15	SPARE		35	SPARE	
16	SPARE		36	SPARE	
17	SPARE.		37	SPARE	
18	SPARE	TB1	38	GND	
19	SPARE		39	MCLR	
20	[illegible]		40	GND	

Human Factors Engineering

In developing the design of the SEA WATCH Console, two types of human engineering analyses were conducted. First, the physical configuration of the console and return was analyzed in order to evaluate the human engineering aspects of that particular design in terms of the requirements. Secondly, a human engineering analysis was conducted for the operator and the physical tasks which he is required to perform, using an adjustable mock-up of the console, control panel and return.

It was concluded that the underside of the control panel turret should be 27.5 inches from the floor. That height is suitable for long-term operation for approximately 90 percent of the operators, that is, those between the fifth percentile and the ninety-fifth percentile. By permitting the turret to raise and lower slightly, all users should be able to find a comfortable position. The design provides for the top horizontal surface of the control panel to be at the same level as the return. An eight inch deep notch will be cut in the return to bring the writing surface closer to the operator. This feature was adopted after conducting tests on an adjustable mock-up. The notch reduces the amount of motion required of the operator when moving frequently from the keyboard to the return. In that connection, it is recommended that adjustable swivel chairs on rollers be provided to the operators in order to further reduce fatigue.

The design of the control panel, as shown in figure 3-6, consists of a central sloped panel and two horizontal 8-inch wide surfaces. All of the major components are placed on the central sloped panel, while the zoom/cursor controls and the ashtray/cup receptacle are located on the right and left sides, respectively. That surface is at a height of 29.5 inches, which is the same height as the top surface of the return. This allows the return to mate to the console with a flush surface.

The following comments will serve to explain the rationale behind the proposed arrangement of the control panel. In order to optimize the location of all controls for both the right- and left-handed operators, the function panel and the set of sixteen indicator lights have been reconfigured and relocated.

By relocating and reconfiguring these items into three rows of sixteen modules directly above the keyboard, a bias in favor of a left-handed operator has been eliminated. With the controls as shown in figure 3-6, it is now possible for either a right- or left-handed operator to work the function keyboard with equal ease.

Additionally, there is an inherent limitation in rear projection devices such as the one used for the function on switches. They are quite directional and should not normally be viewed from an angle greater than 35 degrees from a line perpendicular to the face of the device. By relocating these indicators so that the array is centered laterally on the sloped section of the control panel, it becomes possible for the operator to read the displays without moving from his normal seated position.

The zoom controls and trackball can be located either on the right side for a right-handed operator as shown in figure 3-6, or on the left side in the case of a left-handed operator. In each case, a combination ashtray and cup receptacle panel which is mechanically interchangeable with the trackball/zoom control panel would

be installed on the opposite side of the control panel as a convenience to the operator and as a means to minimize and control the location of possible spillage. The interchange of the zoom controls and trackball with the convenience tray can be made at any time after installation. A serviceman is required to make the change.

In addition to the considerations given to increasing the operator's efficiency during his active use of the controls, consideration must also be given to the operator's passive actions (i.e., the viewing of the CRT displays). In order to present the operator with the most readable display under the given condition, a hood has been provided over the screens of the displays in order to reduce the amount of ambient light striking the surface of the screens. The use of a hood improves the apparent contrast of the display while at the same time reducing or eliminating reflected highlights. The overall effect on the operator will be to reduce eye fatigue and to reduce the possibility of errors in interpreting the displayed information. The hood will be able to be raised and pushed back over the top of the consoles when it is desired to permit standing persons full view of the screens. See figure 3-14(a).

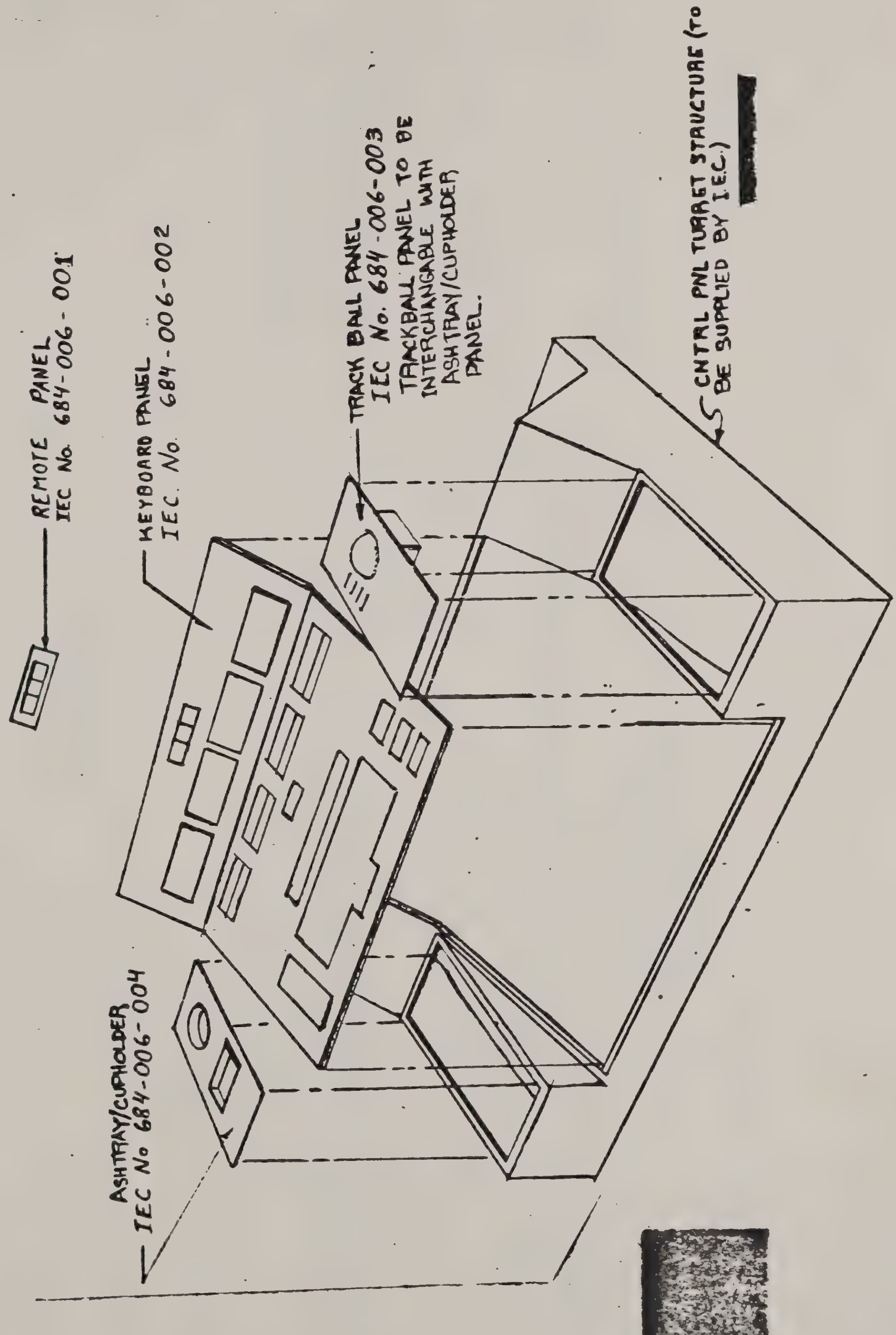


Figure A. Control Panel Assembly

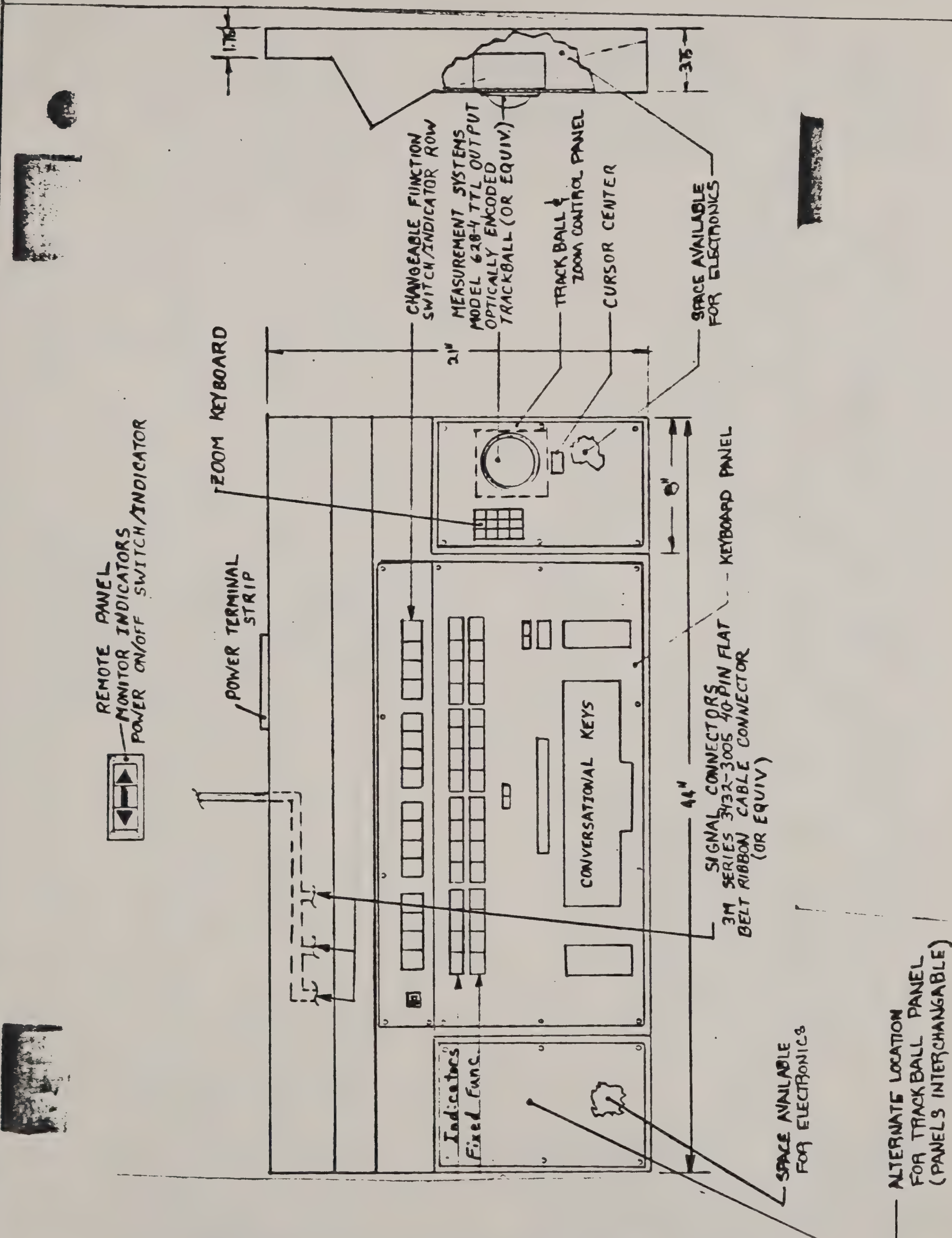


Figure B. Control Panel Assembly (Detailed)

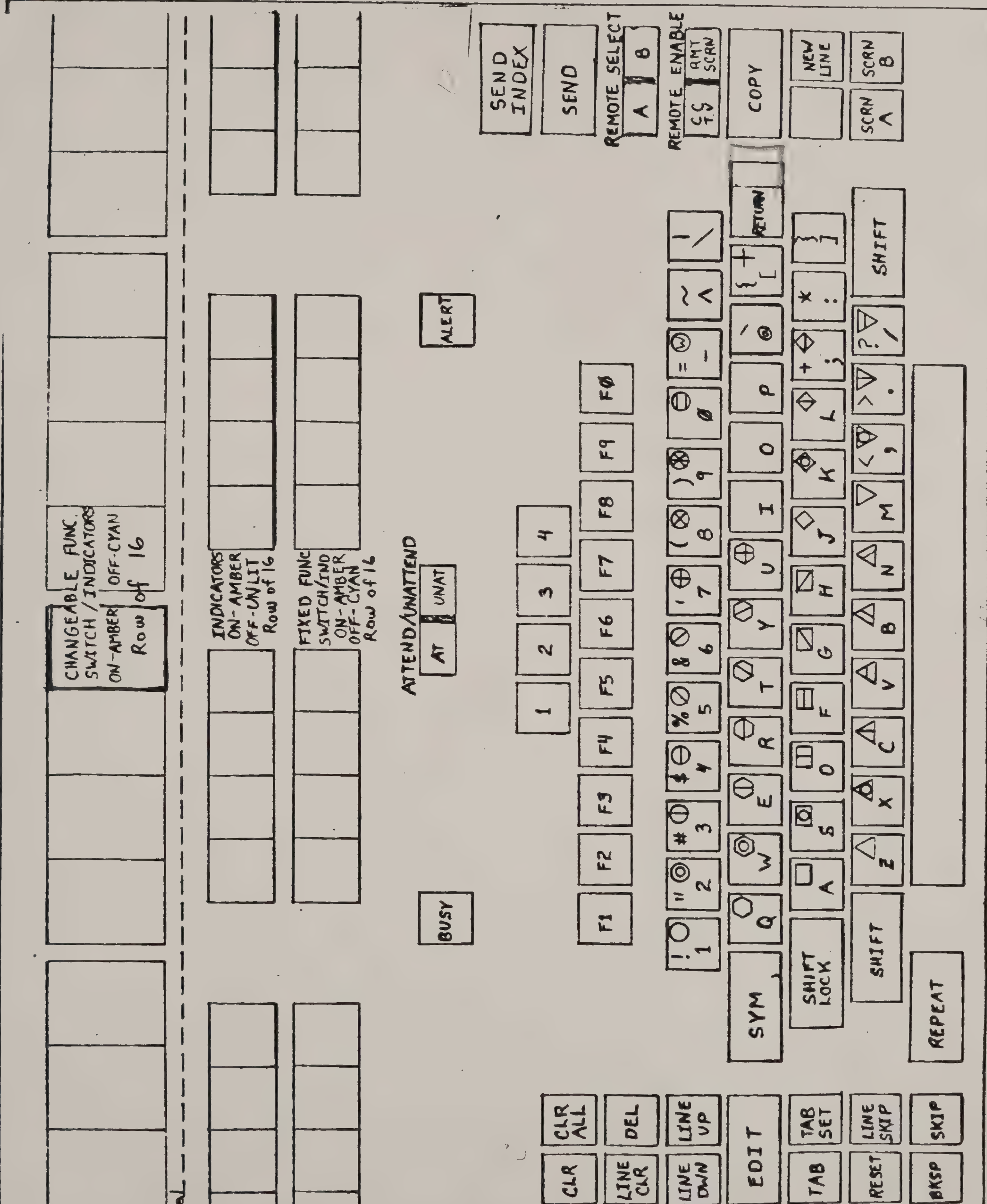


Figure C. Conversational and Special Keyboard

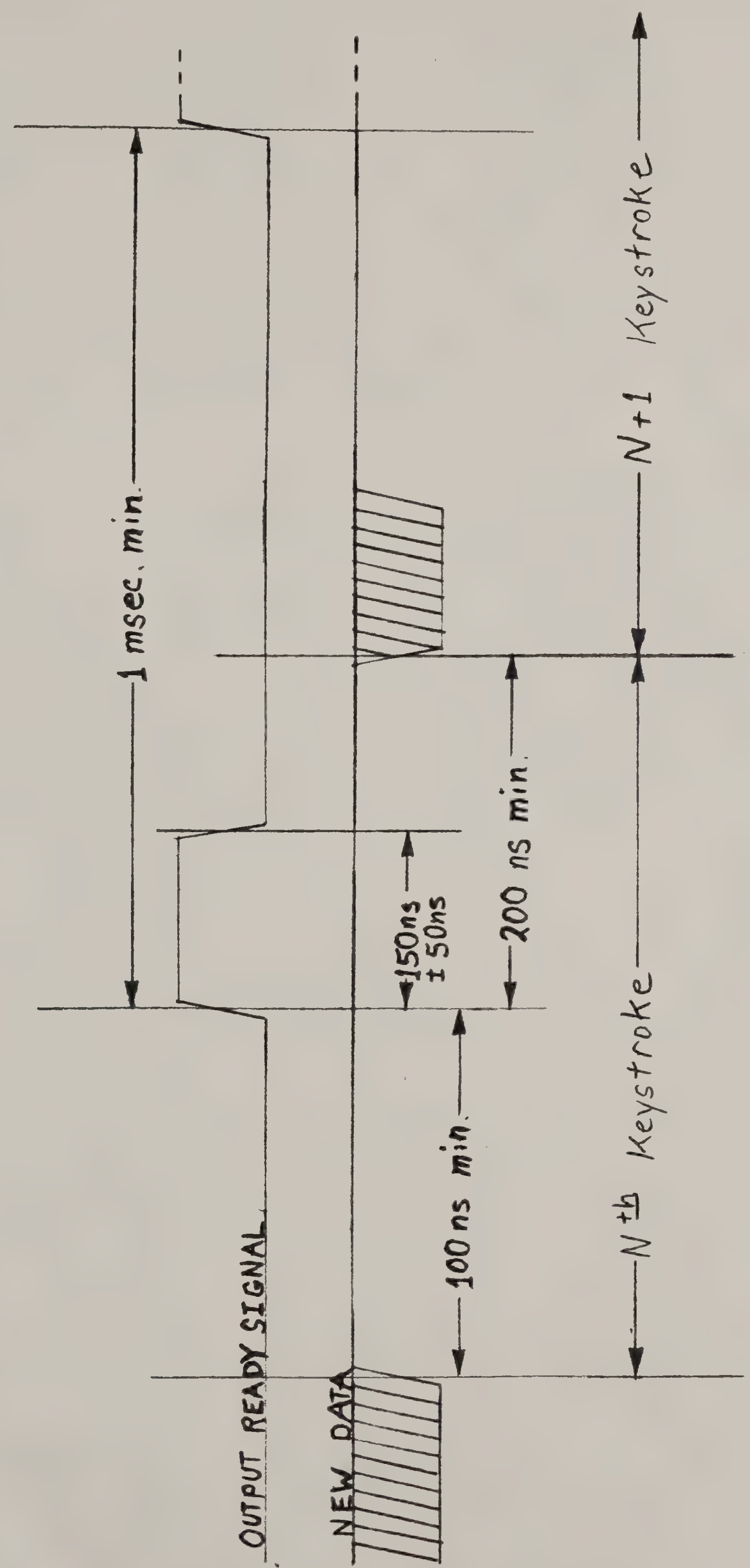


Figure D. Keyboard Output Timing

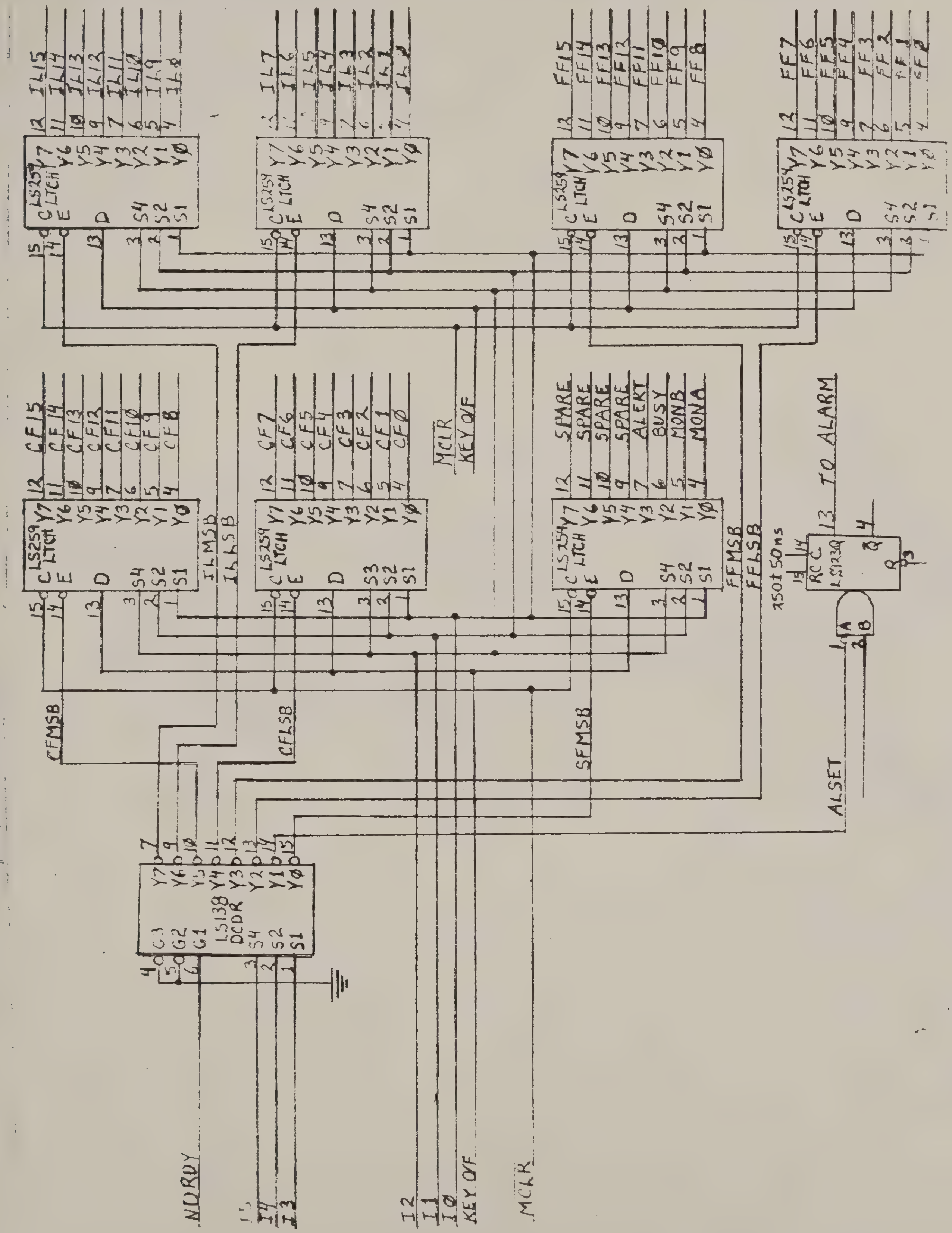


Figure E. Indicator Addressing

MICRO SWITCH

PANELS AND PC BOARDS

This data sheet contains information to aid the customer in designing and building keyboards using MICRO SWITCH SD keyboard modules.

An SD keyboard consists of SD switch modules, buttons, a mounting panel (incorporating precisely located holes for module location) and a printed circuit board. Once the basic layout has been defined and the mechanical constraints determined, the SD mounting panel and PC Board can be designed.

Figure 1
Typical SD Keyboard

Panel Design

In order to maintain the mechanical integrity of the keyboard, a mounting panel must be used. This panel precisely locates the switch modules and should be firmly attached to the PC board. Design requirements are:

1. Material - .050 thick steel - 1/2 hard. If cold rolled steel is used, a .002 inch thick coating of black epoxy is recommended.

2. The holes for mounting the module must be .620 $\pm$ .002 square before coating and must be precisely located to assure the switch terminals will align with the PC board.

Three different methods of attaching the panel to a printed circuit board can be used: rivets, retaining screws and/or spacers, and spread tabs. The recommended method is spread tabs. Figure 2 is a typical panel drawing with spread tabs showing how to locate the module mounting holes and the detail of the spread tab feature.

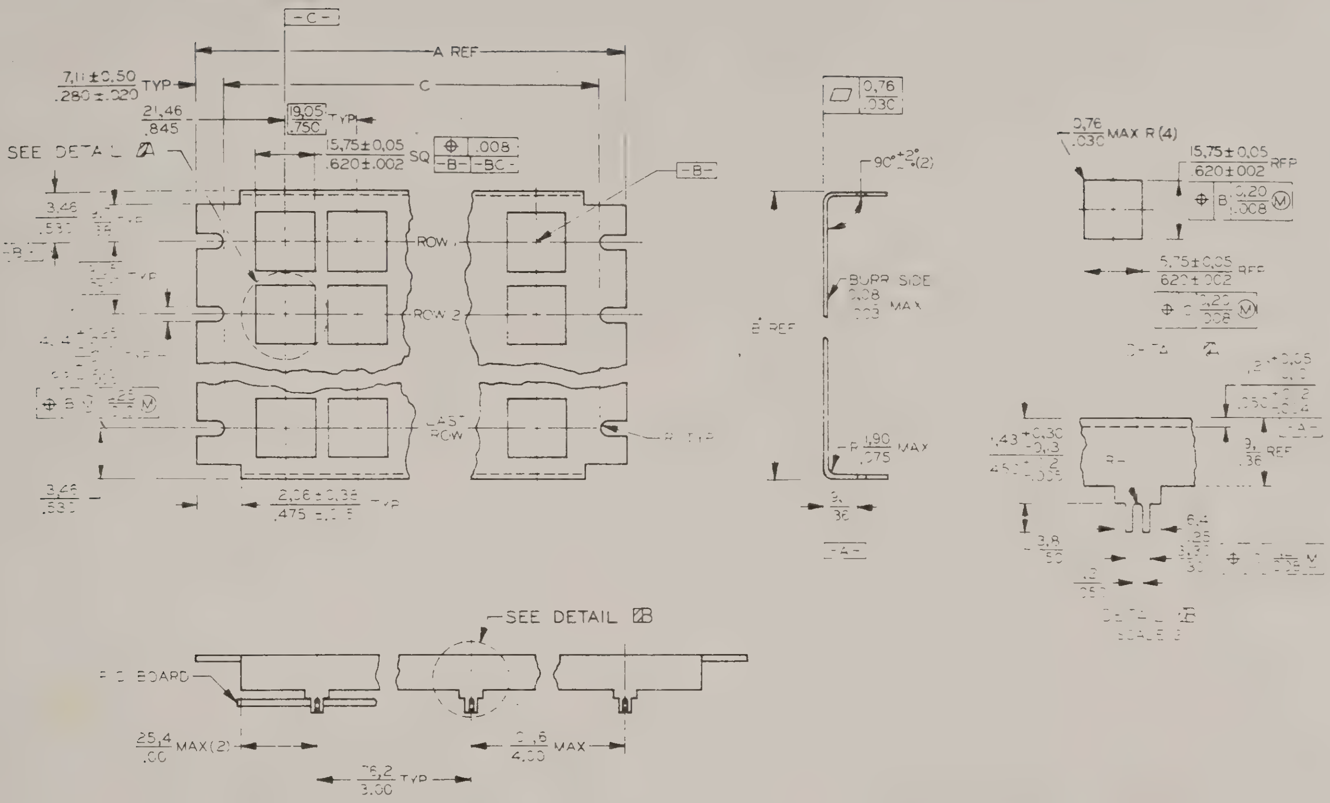


Figure 2
SD Mounting Panel Dimensions

The spread tabs are spread using a suitable tool such as a screwdriver as shown in Figure 3 to firmly attach the panel to the PC board.

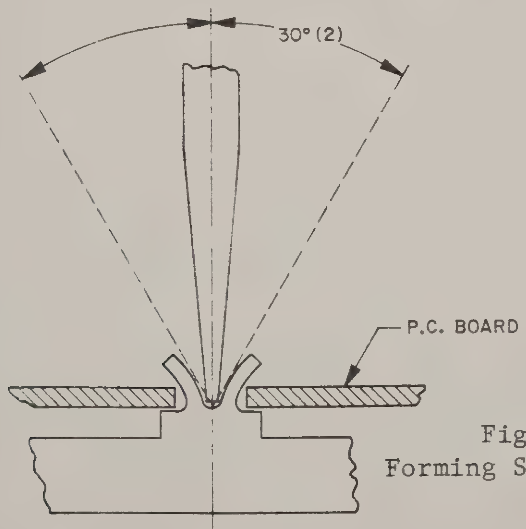


Figure 3
Forming SD Spread Tab

The locations of the spread tabs are dictated by the specific panel and printed circuit board application. Spread tab locations must correspond to the spread tab holes in the PC Board which in turn relate to the switch terminal holes in the PC board. General recommendations for spread tab location are as follows:

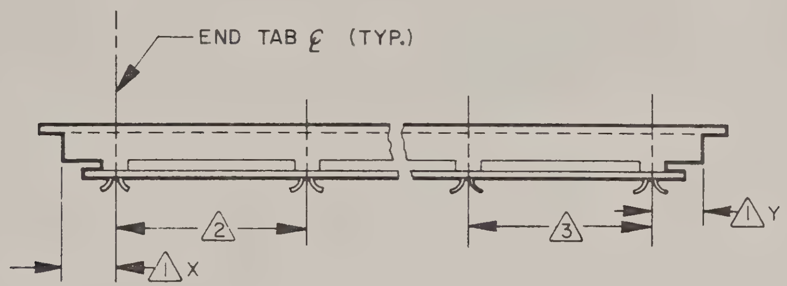


Figure 4
General Spread Tab Location

1. The center line of the panel and tabs should be located less than 1.0 inch from the end of the panel form. Dimension (X) should equal dimension (Y). See Figure 4, dimension 1.

2. The intermediate tabs should be placed 3.0 inches on center referenced from the end tab. See Figure 4, dimension 2.

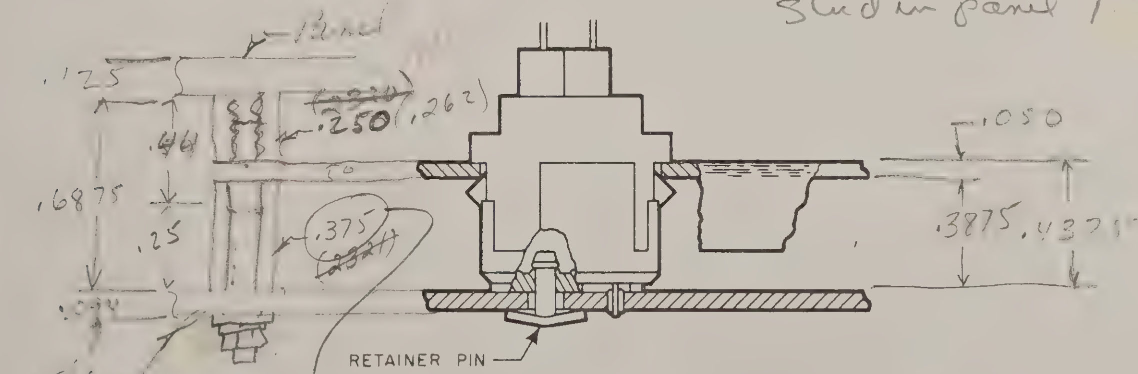
3. Additional tabs are required if the distance between the last intermediate tab and the opposite end tab is greater than 4.0 inches. See Figure 4, dimension 3.

4. The spread tabs should be placed symmetrically along the front and back edges of the panel.

MICRO SWITCH uses plastic retainer pins (catalog listing SD-10381) to provide support to the printed circuit board during wave soldering, handling and use. These pins assemble through the PC board to the module housing as illustrated in Figure 5.

Note: A .125 dia. hole is required in the PC board for each retainer pin used (see Fig. 6 for hole location).

Stud in panel 1" lg



.425 spacer

Figure 5
Retainer Pin Assembly

Revised to use threaded standoff

A retainer pin is recommended in a module under the following conditions:

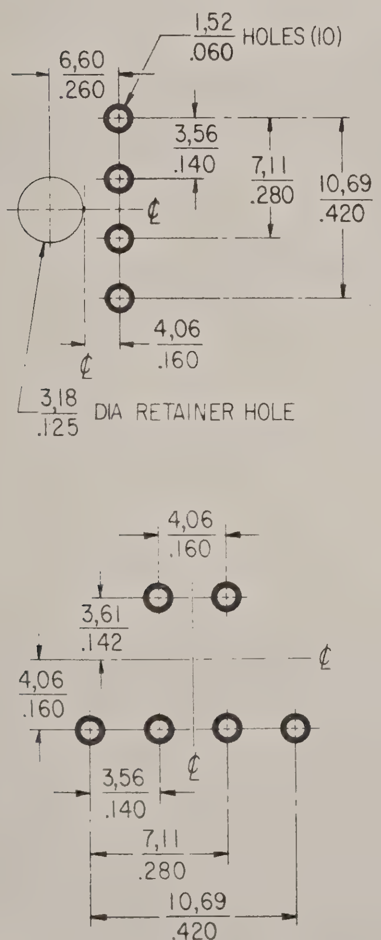
1. Row end modules in the center row of a 5 row keyboard. An additional retainer pin should be added for every additional two rows of modules.
   Example: a 5 row keyboard - add one retainer pin in each end module of the center row.
   A 7 row keyboard - add one retainer pin in each end module of rows 3 and 5.

2. The retainer pins should be located in the appropriate rows and spaced not less than 2 inches or greater than 4 inches apart throughout the rows.

PC BOARD RECOMMENDATIONS

Material: .062 thick.

Recommended hole sizes and locations for the switch modules are shown in Figure 6. Good design practice should be used for pad sizes as well as conducting paths. See Figure 7 for the recommended hole for spread tabs.



NOTES
1 – HOLES SHOWN FOR SOLDER SIDE OF THE PC BOARD
2 – ₵ REFERENCES THE CENTER LINE OF THE MODULE

TOLERANCES APPLY TO DESIGN UNITS. CONVERSIONS ARE ONLY FOR REFERENCE. UNLESS NOTED, TOLERANCES ARE ±				
	DIM. mm	TOL. mm/in	DIM. in	TOL. mm/in
NO PLACES	X	1/.04		
ONE PLACE	X,X	0,4/.016	X.X	0.8/.03
TWO PLACES	X,XX	0,15/.006	X.XX	0.38/.015
THREE PLACES			X.XXX	0.13/.005
ANGLES				
DESIGN UNITS	SI METRIC ☐		US CUSTOMARY ☐	
RAW MATERIAL–COMMERCIAL STANDARD MICRO SWITCH STANDARDS APPLY				
DIMENSIONS ARE TO BE MET BEFORE PROTECTIVE COATINGS ARE APPLIED				

Figure 6
Hole Size and Location

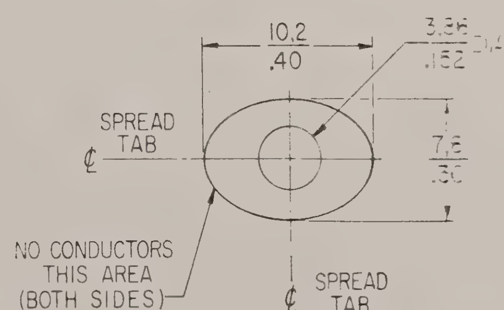


Figure 7
Spread Tab Hole Size

Figure 8 illustrates a typical PC board and the recommended dimensions and tolerances.

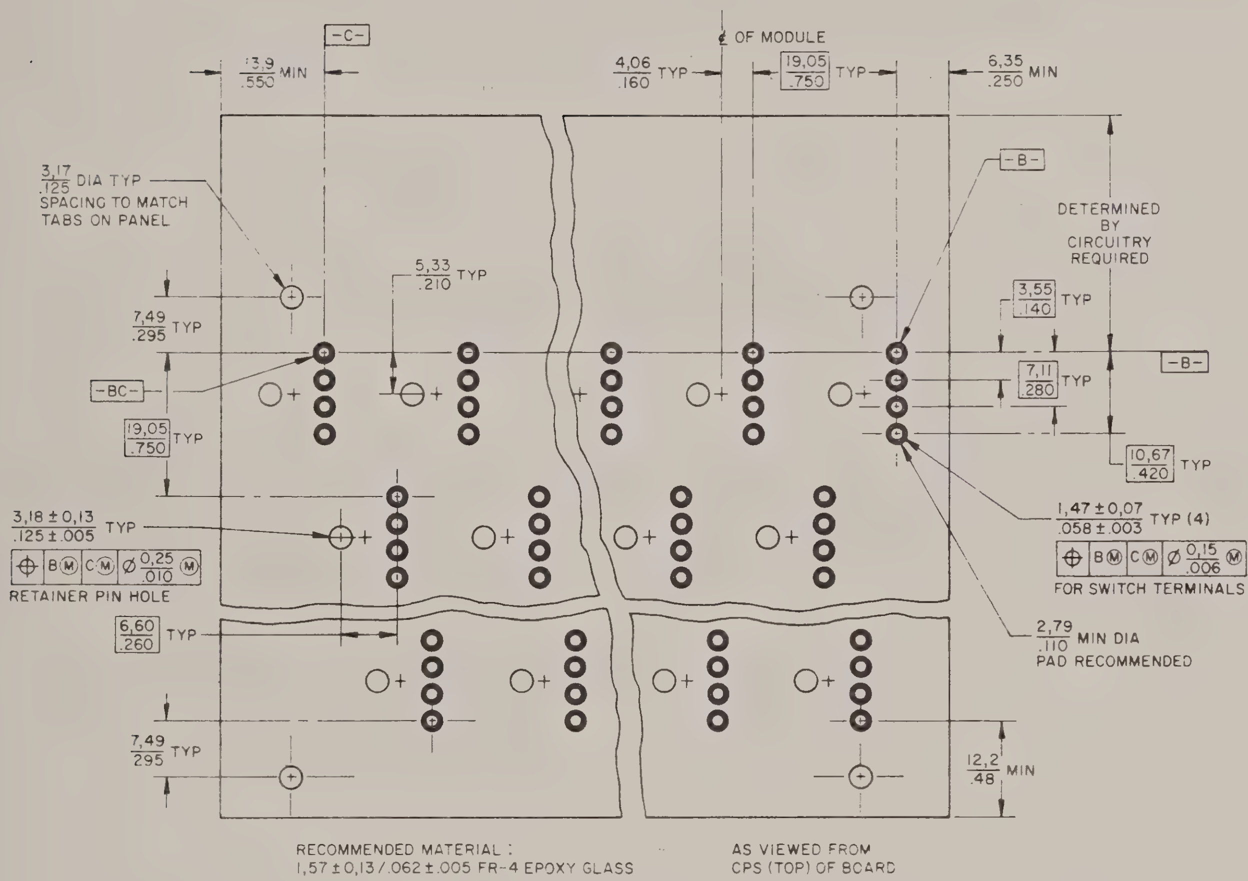


Figure 8
Typical PC Board

SD ASSEMBLY

After all electronic components are inserted into a printed circuit board, the first assembly operation is attaching the PC board to the mounting panel using spread tabs. This insures proper alignment of the panel and PC board for module insertion. Once all tabs are through the circuit board, the panel is secured by forming the tabs. Figure 3 illustrates.

The next step is to snap the appropriate module in its panel location. Care should be exercised to make sure the terminals align to the PC board.

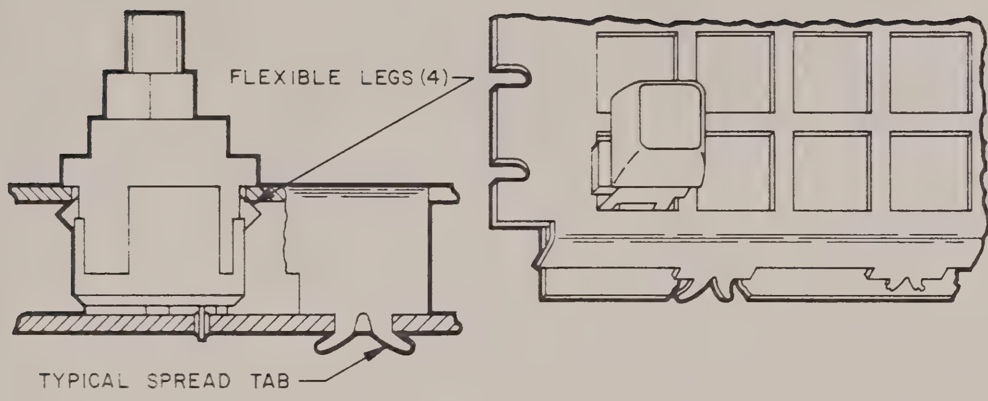


Figure 9
Assembled SD Module

When assembled, the SD module is located within the panel and retained by four flexible legs on the module. The dimensional relationship between the module housing and the mounting hole perimeter allows movement of the module by flexing the legs and provides self-alignment to the printed circuit board. See Figure 9. It is at this point that the retainer pins, if any, are inserted.

WAVE SOLDERING AND CLEANING SD MODULES

Care must be taken during wave soldering and cleaning operation of SD modules. If temperatures exceed certain limits, damage may result from unsoldering the leads from the ceramic sensor pack. Excessive flux in the module will cause operation problems after cleaning.

The SD module must not be cleaned in solvent cleaning systems. The solvents attack the chip potting materials and cause electrical failure.

The following wave soldering and cleaning procedures are the only methods recommended for SD modules.

Wave Soldering

Flux, preheat, solder temperatures and speeds are as follows:

1. Flux - London Chemical Co. - Loncoflux - 106A35X, or equivalent.
2. Preheat - Preheaters should be set to give 200°F (95°C) on top of the PC board just prior to board entering the wave.
3. Solder temperature - 500°F (260°C) maximum, preferably 485°F to 500°F.
4. Speed - Set conveyor speed to approximately 4 1/2 ft/min (1,37 meters/min).

Cleaning [Flux Removal]

The flux used for wave soldering is a rosin base flux and is the only one recommended for use with the SD module. Water soluble fluxes are not recommended as they can cause corrosion problems with the finished product.

Generally, there are two types of contaminants on a printed circuit board after wave soldering with rosin base fluxes. The first is an ionized or polar contaminant such as salts, acids or bases deposited on the board during fluxing, handling or printed circuit fabrication. The second is a neutral or non-polar contaminant such as rosin, oil, dust, etc. A satisfactory cleaning operation must remove both polar and non-polar contaminants without further contaminating the assembly.

The cleaning process recommended here removes all types of contaminants listed.

Detergent - London Chemical Co. - Loncoterge - 446 or equivalent.

Recommended Equipment - Dee Electric Aqueous Cleaner, or equivalent.

Equipment to include the following:

1. Wash Section

   130°F (55°C) maximum water temperature, 5 to 10% maximum solution, 120 psi nozzle pressure, conveyor speed 3 ft/min. minimum. Recirculating tank.

2. Rinse Section #1

   Tap water, not softened, unheated, non-recirculating, with high pressure nozzles (120 psi).

3. Rinse Section #2

   Deionized water only. High pressure nozzles (120 psi) unheated, and non-recirculating.

4. Air Knife Section

   To remove excessive amounts of water. Note: if the boards do not come out dry, step 5 must follow.

5. Drying Section

   160°F drying for 10-15 minutes, preferably in a non-circulating conveyor oven.

In this cleaning system, the detergent in the wash section removes the non-polar contaminants, the first rinse removes the detergent solution and the deionized water rinse removes the polar contaminants. The air knife and dryer remove all moisture from the assembly so that it can be electronically tested.

SPECIAL TOOLS

Special tools are available to assist in keyboard assembly and repair. These tools can be used to easily remove a module or button from a keyboard. Instructions are as follows:

Switch Button Removal

Remove the button from the module being replaced and as many adjacent buttons as required to furnish adequate work space. The buttons can be removed by pulling or prying upward with a padded tool, from their under surface. MICRO SWITCH recommends using the "Keytop Puller." This unique device makes the job of pulling buttons off the keyboard plungers easier. Order SW-10485.

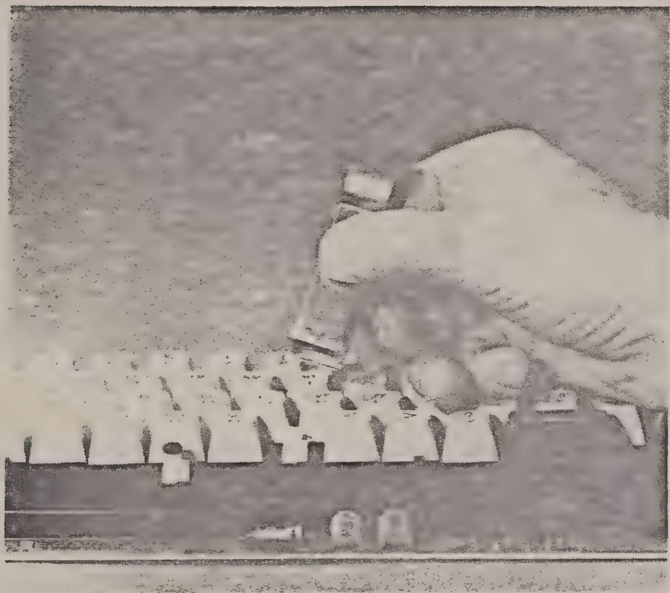


Figure 10
Button Removal

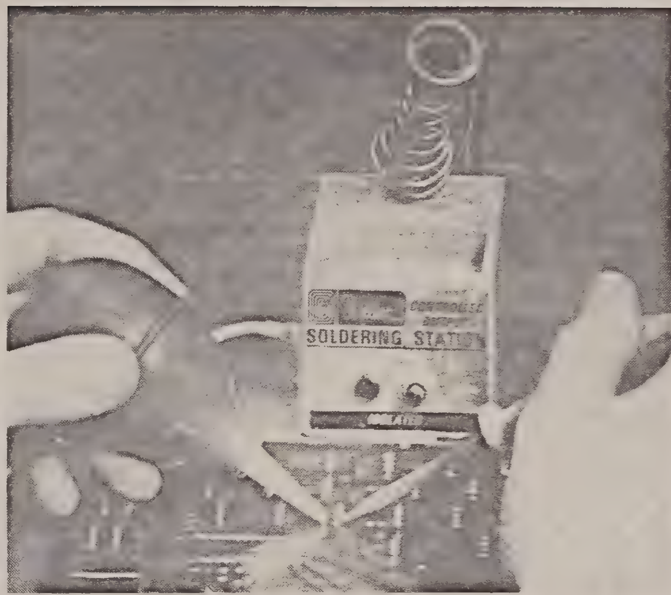


Figure 11
Unsoldering Terminals

Switch Module Removal

Refer to Figure 11. Unsolder the four terminals of the lead frame package from the termination board, using a 750°F controlled temperature iron. Use a solder removal tool to remove all solder from the pin holes in the PC board.

Refer to Figure 12. Insert module removal tool (SD-10101) at each end of the module. With the module removal tools in position, grip the switch module with a pair of pliers and pull straight out (Figure 13).

Figure 12
Inserting Removal Tools

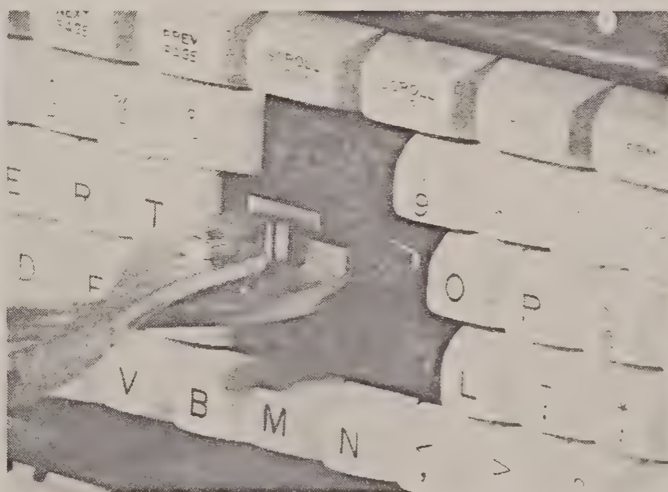
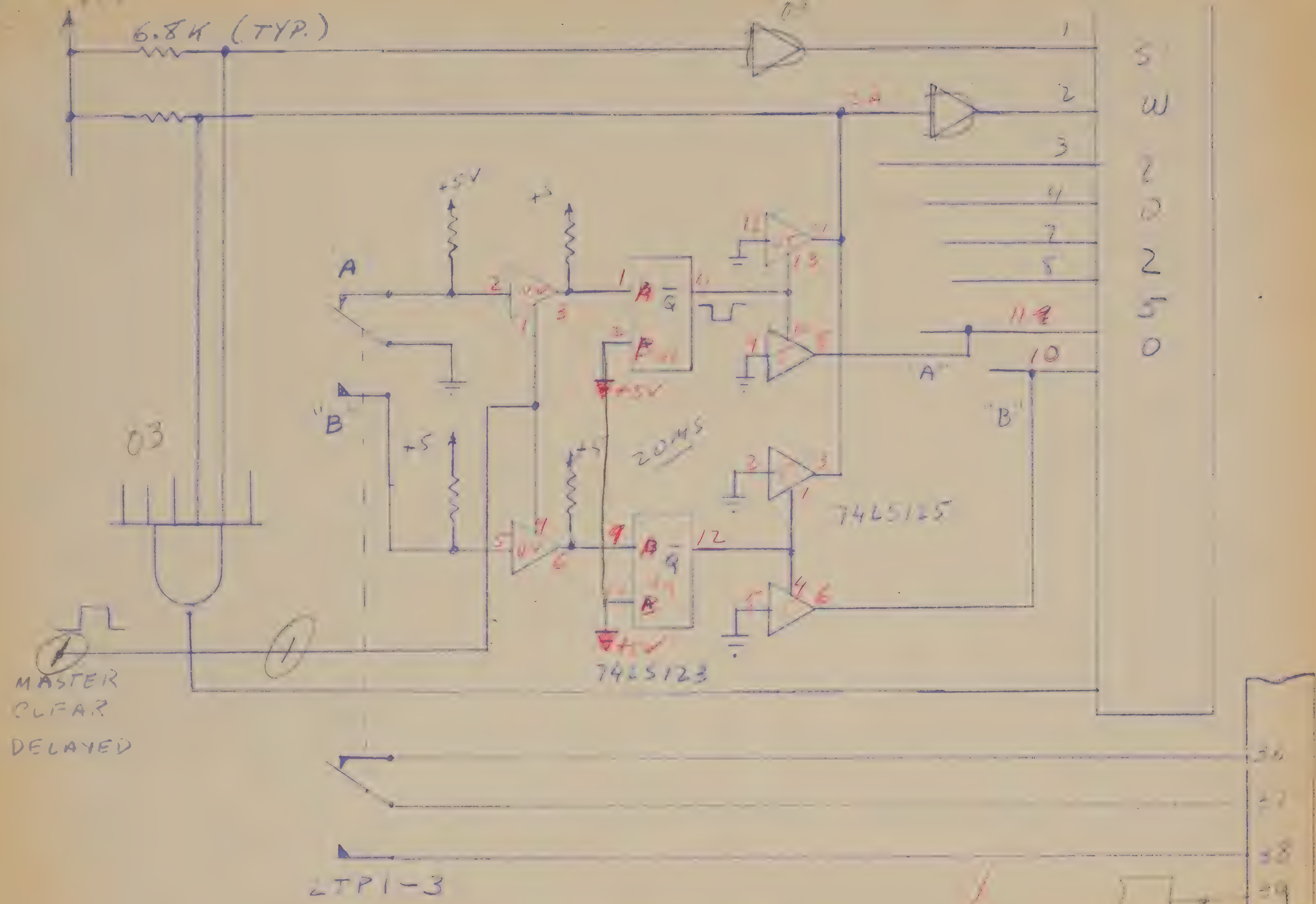


Figure 13
Module Removal

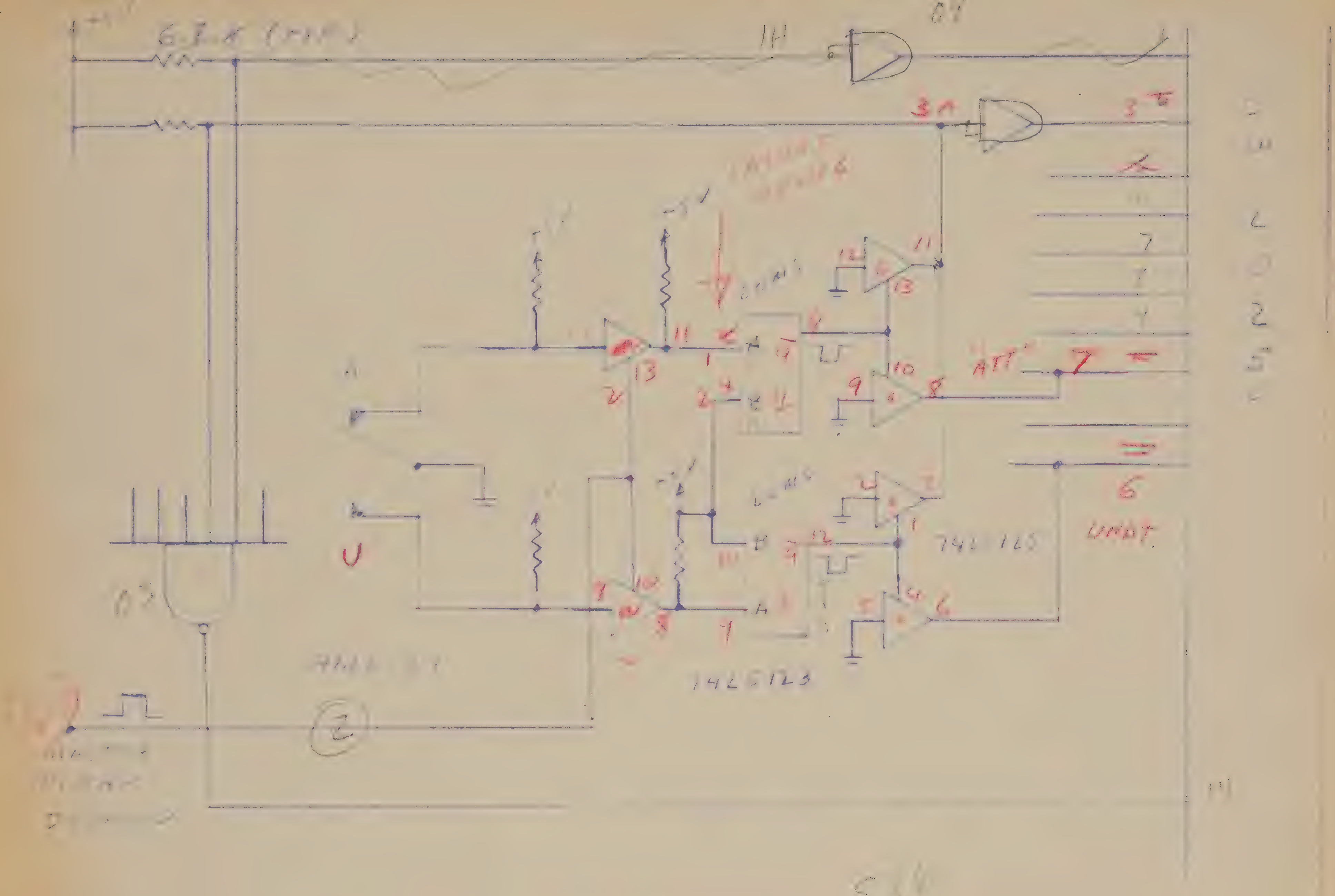
MICRO SWITCH has had years of experience in building keyboards. Application information and assistance is available from our Field Engineers upon request.

While we provide application assistance on MICRO SWITCH products, personally and thru our literature, it is up to the customer to determine the suitability of the product in his application.

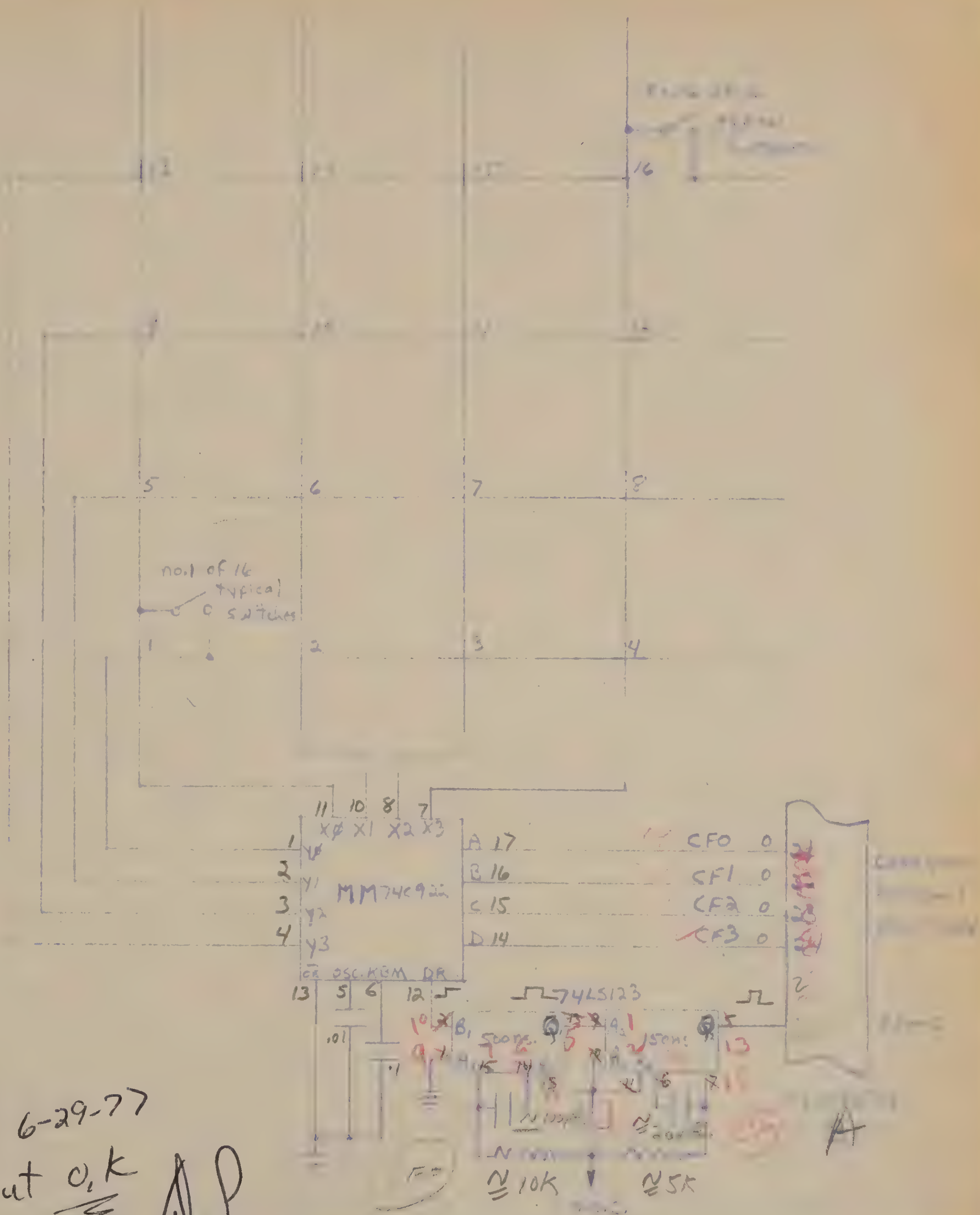


REMOTE SELECT A/B

GROUP D - MODE 2

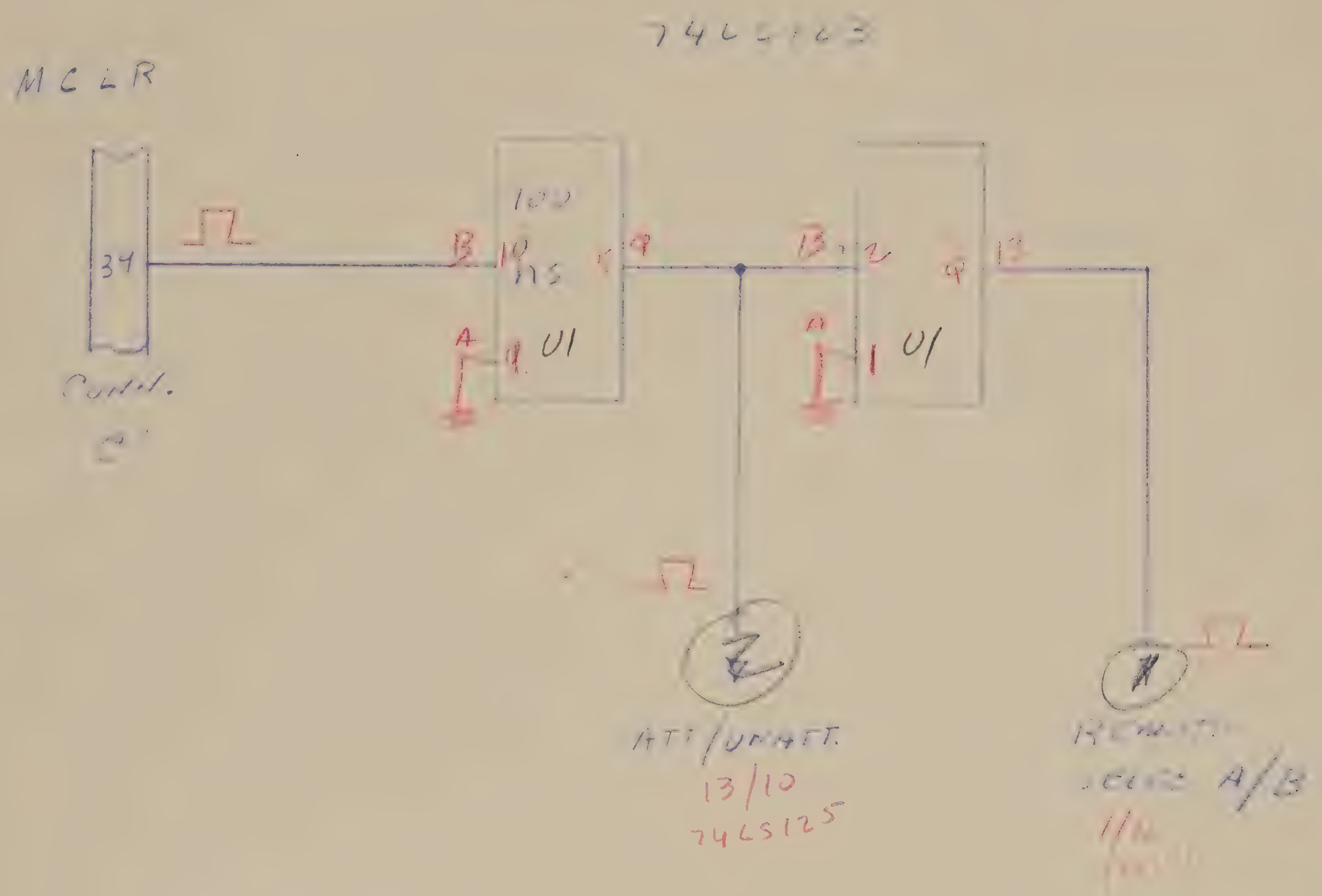


CONVERSATIONAL KEYBOARD



This circuit Breadboarded 6-29-77 checks out O.K

DIMENSIONS ARE IN INCHES AND AFTER PLATING	DR		**Parko** ELECTRONICS COMPANY INC., SANTA ANA, CALIF.
TOLERANCES (unless otherwise specified) .X ±.1 .XX ±.03 .XXX ±.010 ANGLES ±0.5°	CHK		Changeable Function Keyboard
	DSGN		
	PROJ		
	REL		
	APPROVED		CODE IDENT NO. 13979 — SIZE A — REV
MACH SURF ✓	APPROVED		
	DO NOT SCALE DRAWING		SCALE — SHEET OF


74LS123
MCLR
34
B 10
A 9
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B 2
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74LS125
A/B

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BIT 42 04

0 = 1 — 1 — 2 " -47
1 = 2 — 3 — 4 " -48
2 = 3 — 5 — 6 " -49
3 = 4 — 13 — 12 " -50
4 = 5 — 11 — 10 " -51
5 = 6 = 1 — 2 " -52
6 = 7 = 3 = 4 " -53
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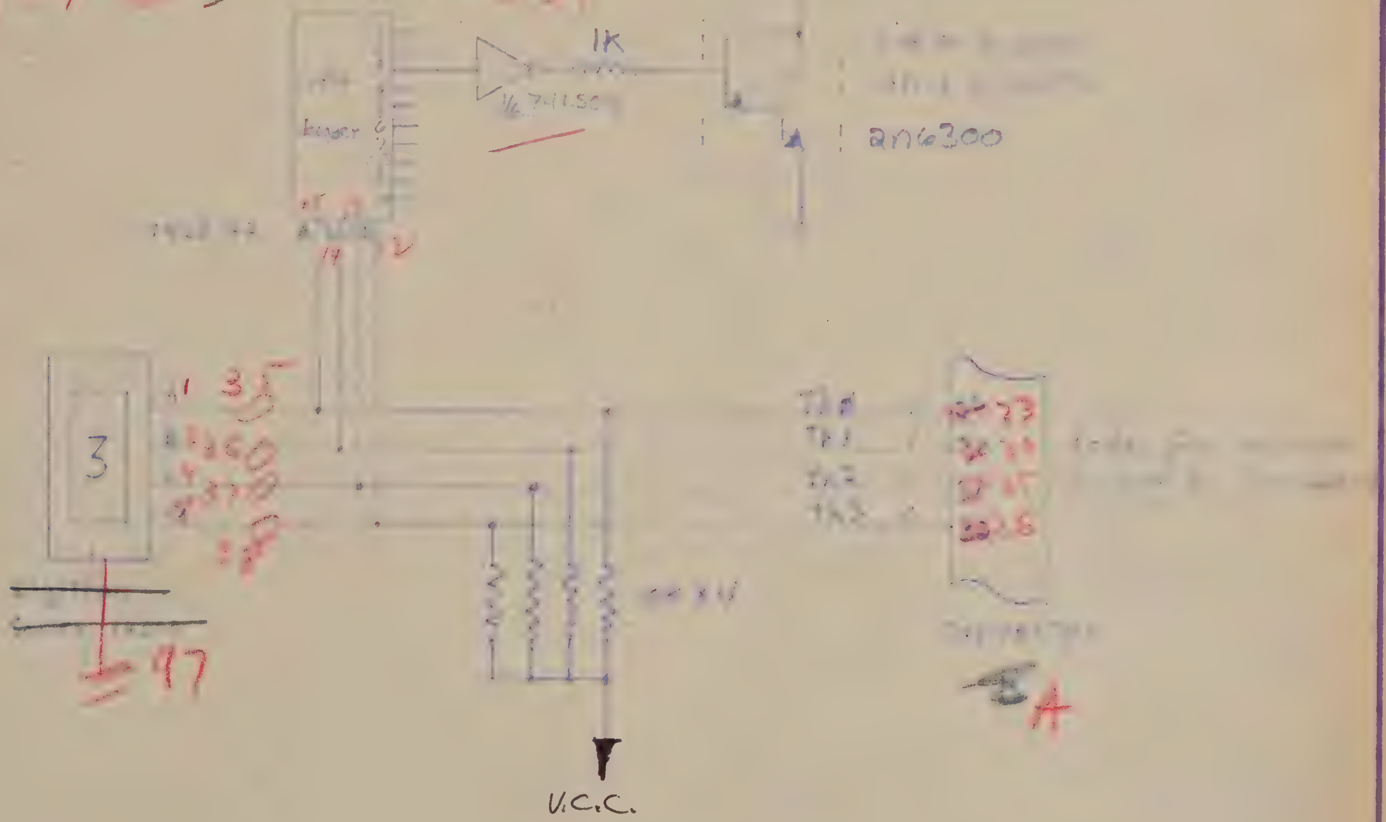
8 = 10 — 11 — 10 " -55
9 = 11 — 9 — 8 — 1 — 56



WORST CASE CURR
1.25 A

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TOLERANCES (unless otherwise specified) .X ±.1 .XX ±.03 .XXX ±.010 ANGLES ±0.5°	CHK	
	DSGN	Changeable Function Thumbwheel
	PROJ	
	REL	
	APPROVED	CODE IDENT NO. 13979 — SIZE A — REV
MACH SURF ✓	APPROVED	
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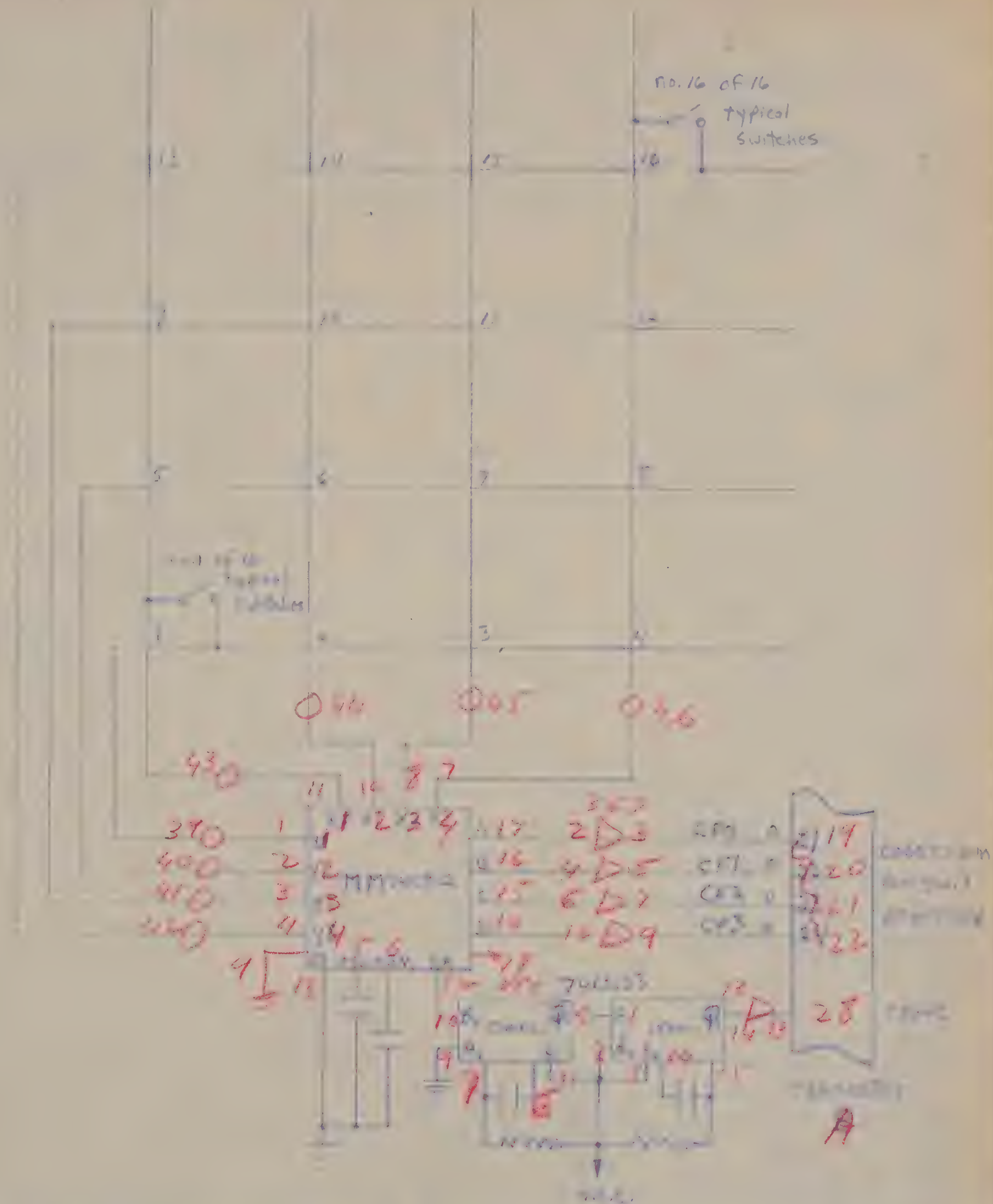


DIMENSIONS ARE IN INCHES AND AFTER PLATING

TOLERANCES (unless otherwise specified)

.X ±.1
.XX ±.03
.XXX ±.010
ANGLES ±0.5°

MACH SURF ✓

DR

CHK

DSGN

PROJ

REL

APPROVED

APPROVED

DO NOT SCALE DRAWING

Parko
ELECTRONICS COMPANY INC., SANTA ANA, CALIF.

Changeable Function Keyboard

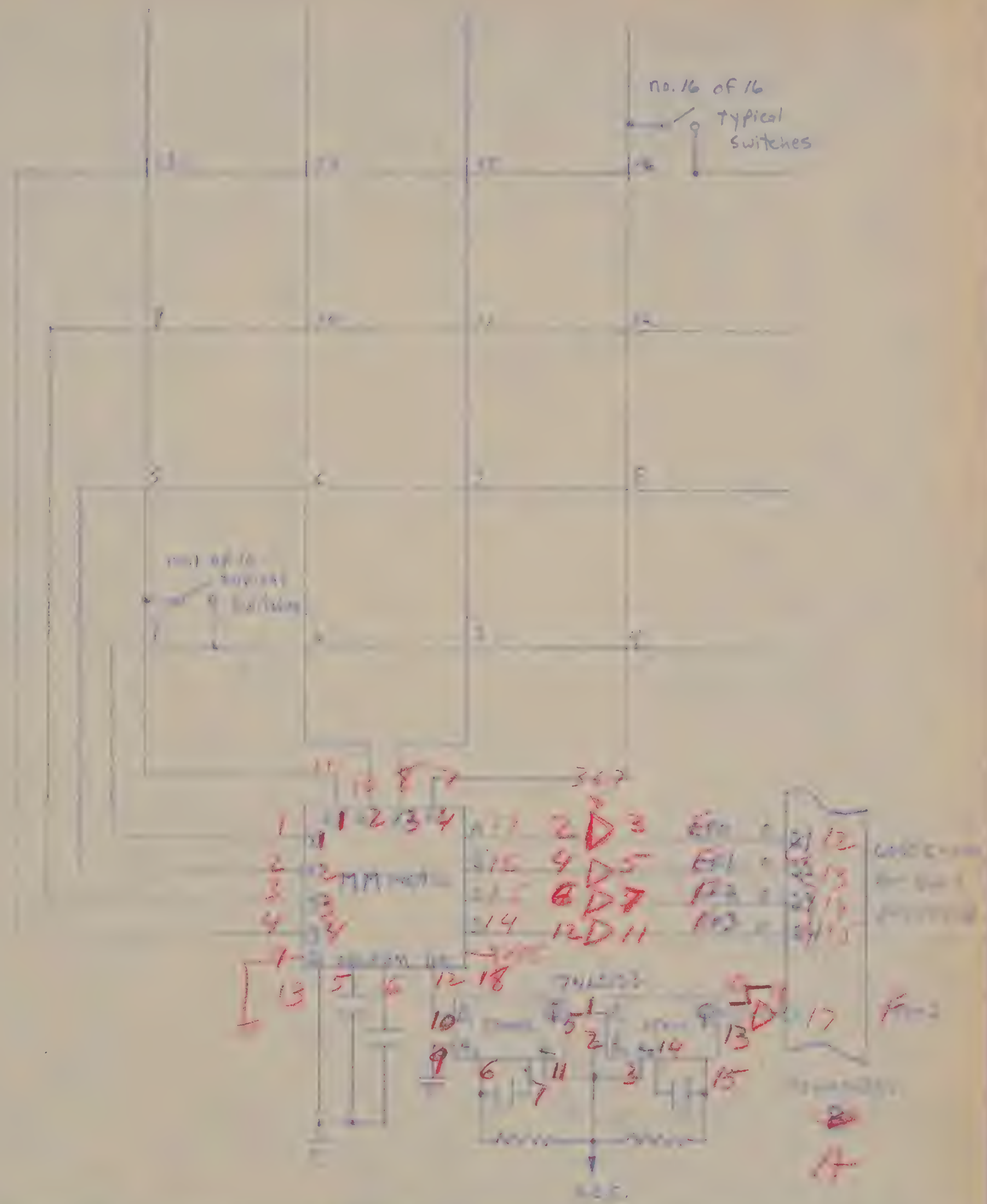
CODE IDENT NO. 13979

SIZE A

REV

SCALE

SHEET OF

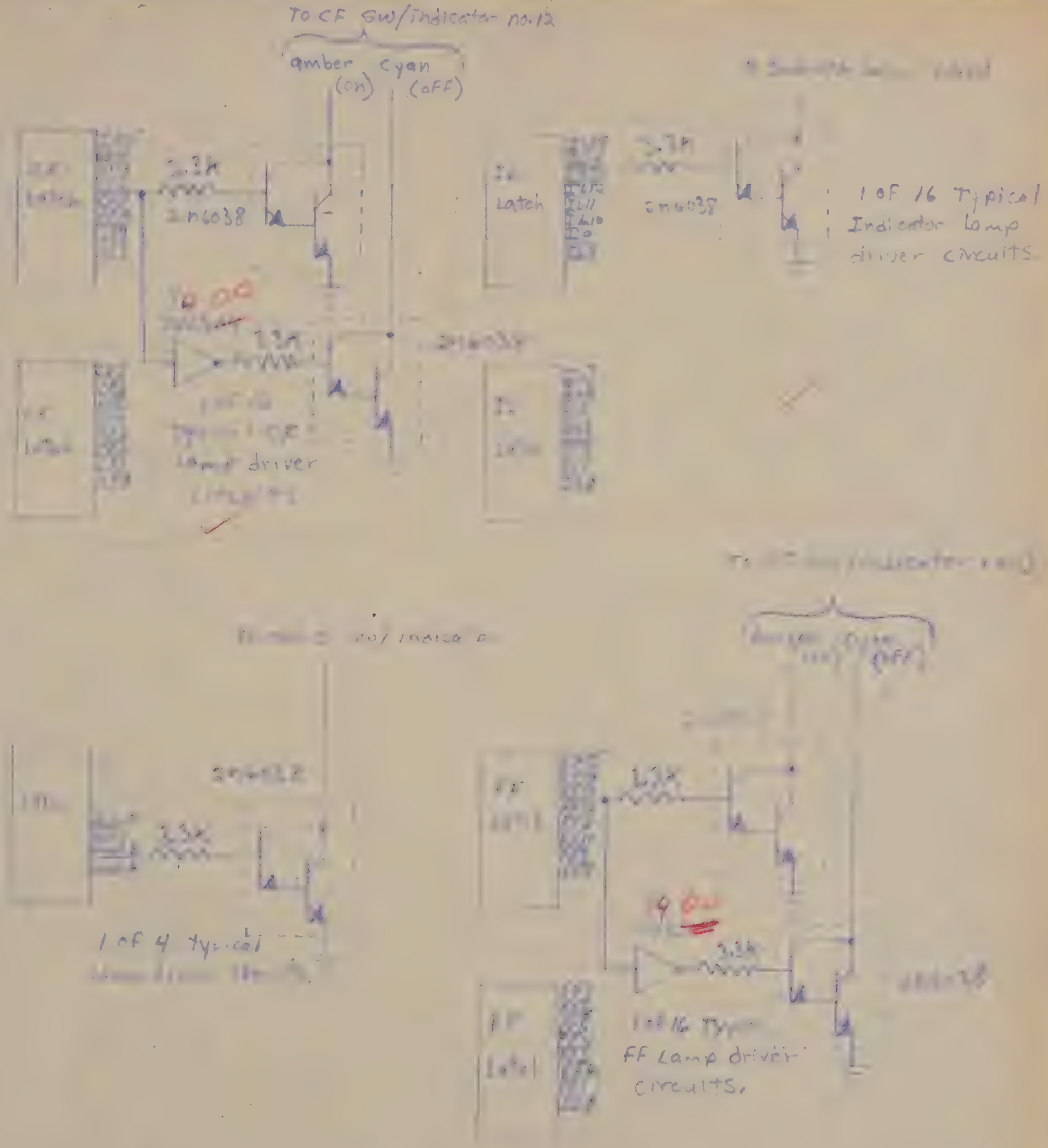


DIMENSIONS ARE IN INCHES AND AFTER PLATING	DR
	CHK
TOLERANCES (unless otherwise specified)	DSGN
.X ±.1	PROJ
.XX ±.03	REL
.XXX ±.010	APPROVED
ANGLES ± 0.5°	APPROVED
MACH SURF ✓	DO NOT SCALE DRAWING

Parko
ELECTRONICS COMPANY INC., SANTA ANA, CALIF.

~~Changeable~~ FIXED Function
Keyboard

CODE IDENT NO.	SIZE		REV
13979	A		
SCALE		SHEET OF	



DIMENSIONS ARE IN INCHES AND AFTER PLATING	DR
TOLERANCES (unless otherwise specified)	CHK
.X ±.1	DSGN
.XX ±.03	PROJ
.XXX ±.010	REL
ANGLES ±0.5°	APPROVED
MACH SURF ✓	APPROVED
	DO NOT SCALE DRAWING

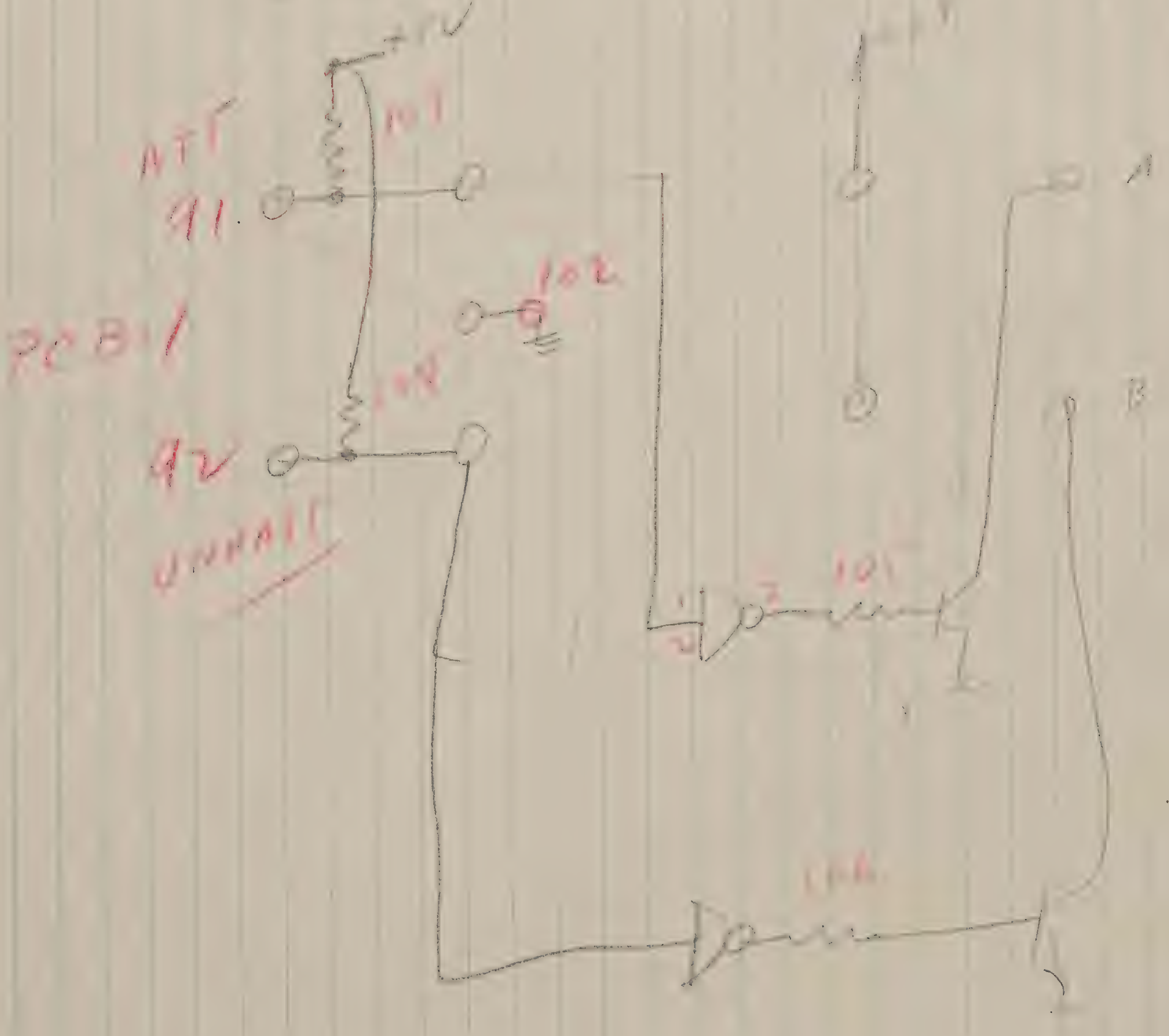
Parko

ELECTRONICS COMPANY INC., SANTA ANA, CALIF.

Lamp Drivers

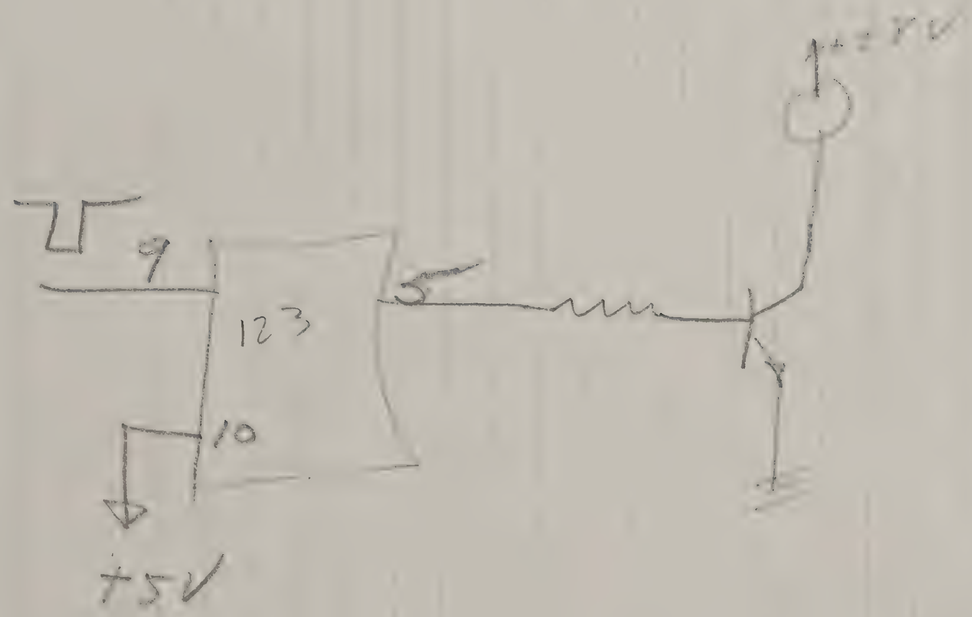
CODE IDENT NO.	SIZE		REV
13979	A		
SCALE		SHEET OF	

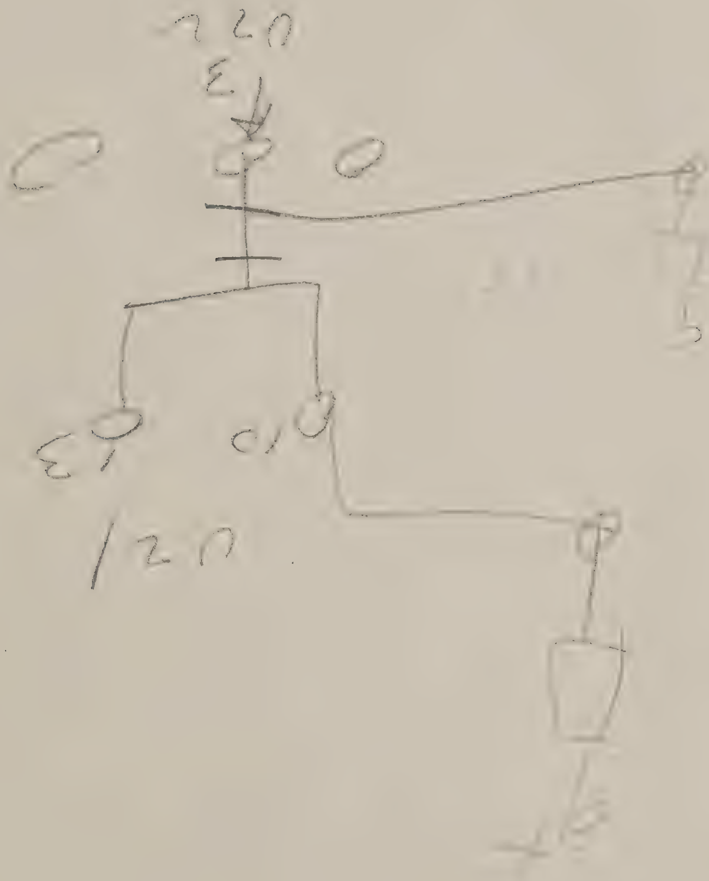
ATT / UNATT



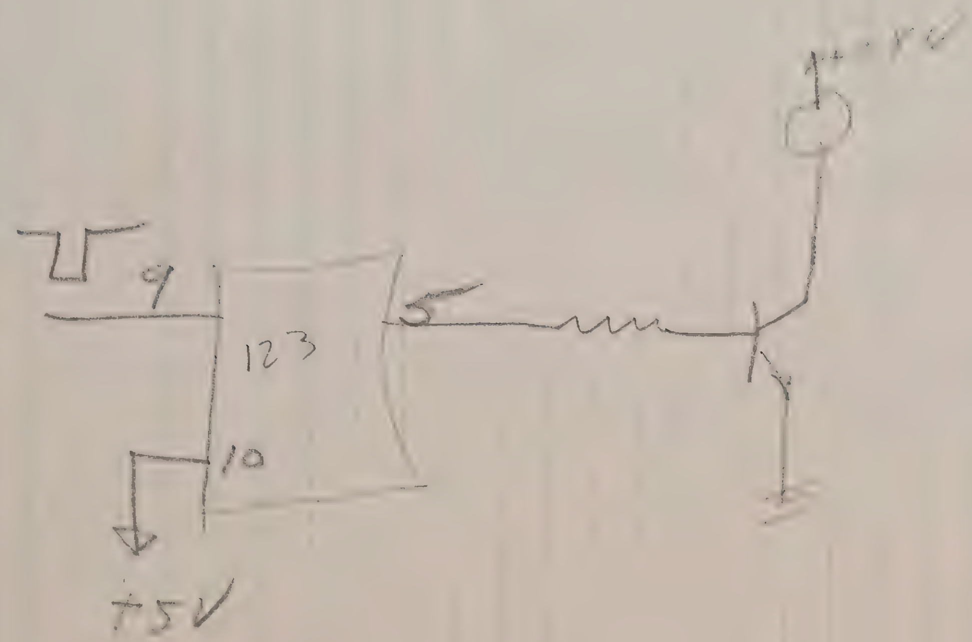
OVER

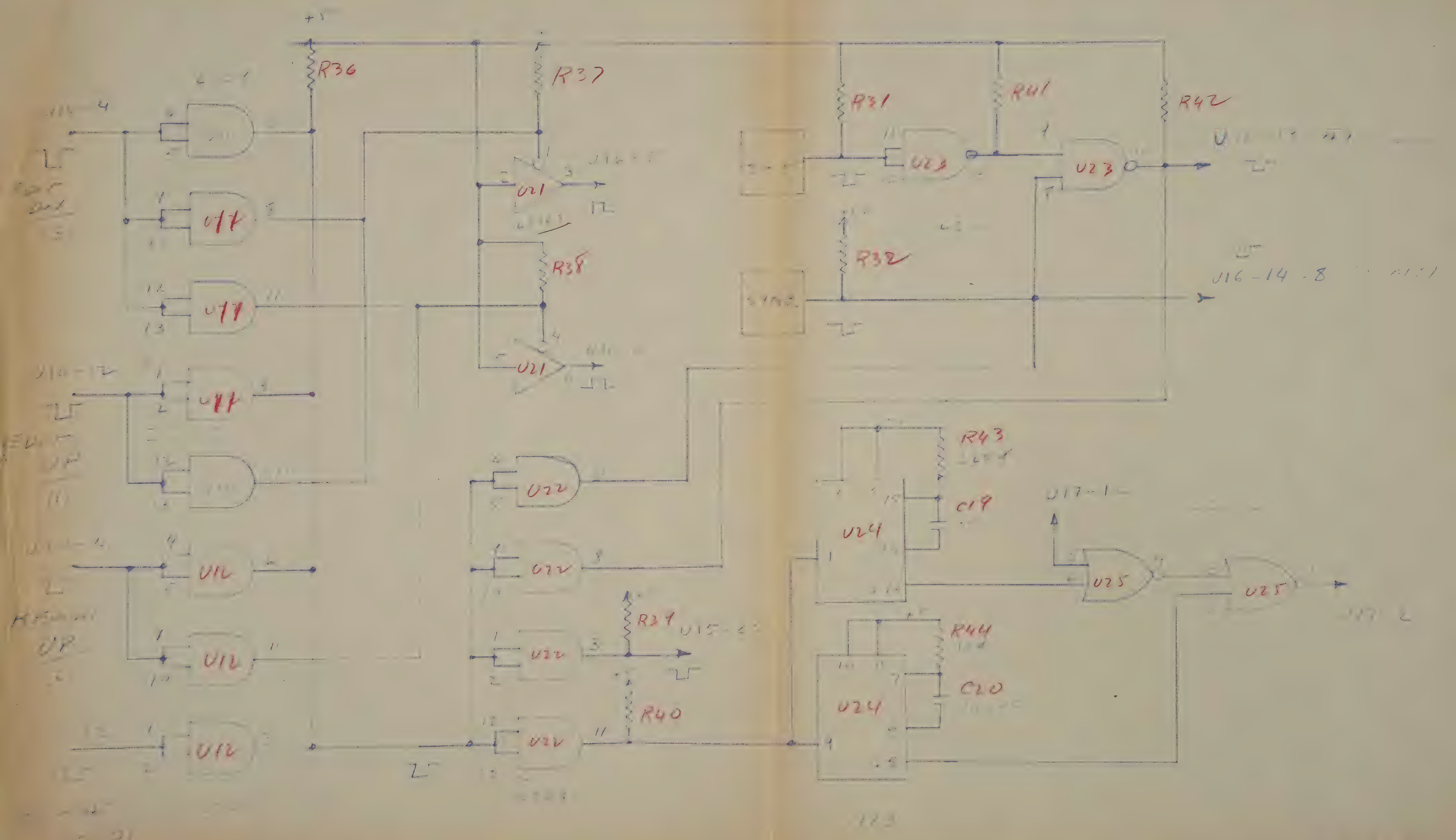
ALARM

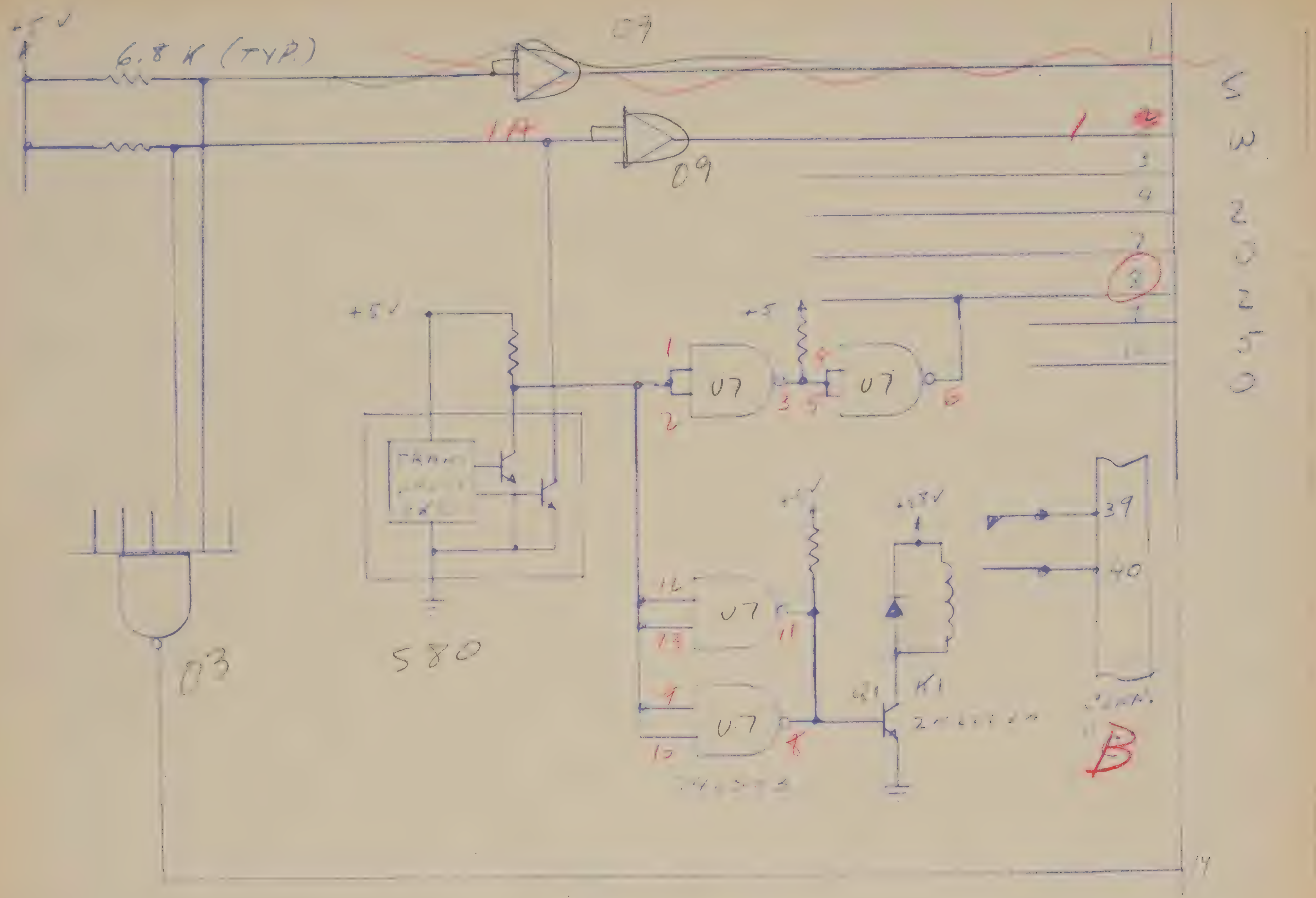




ALARM

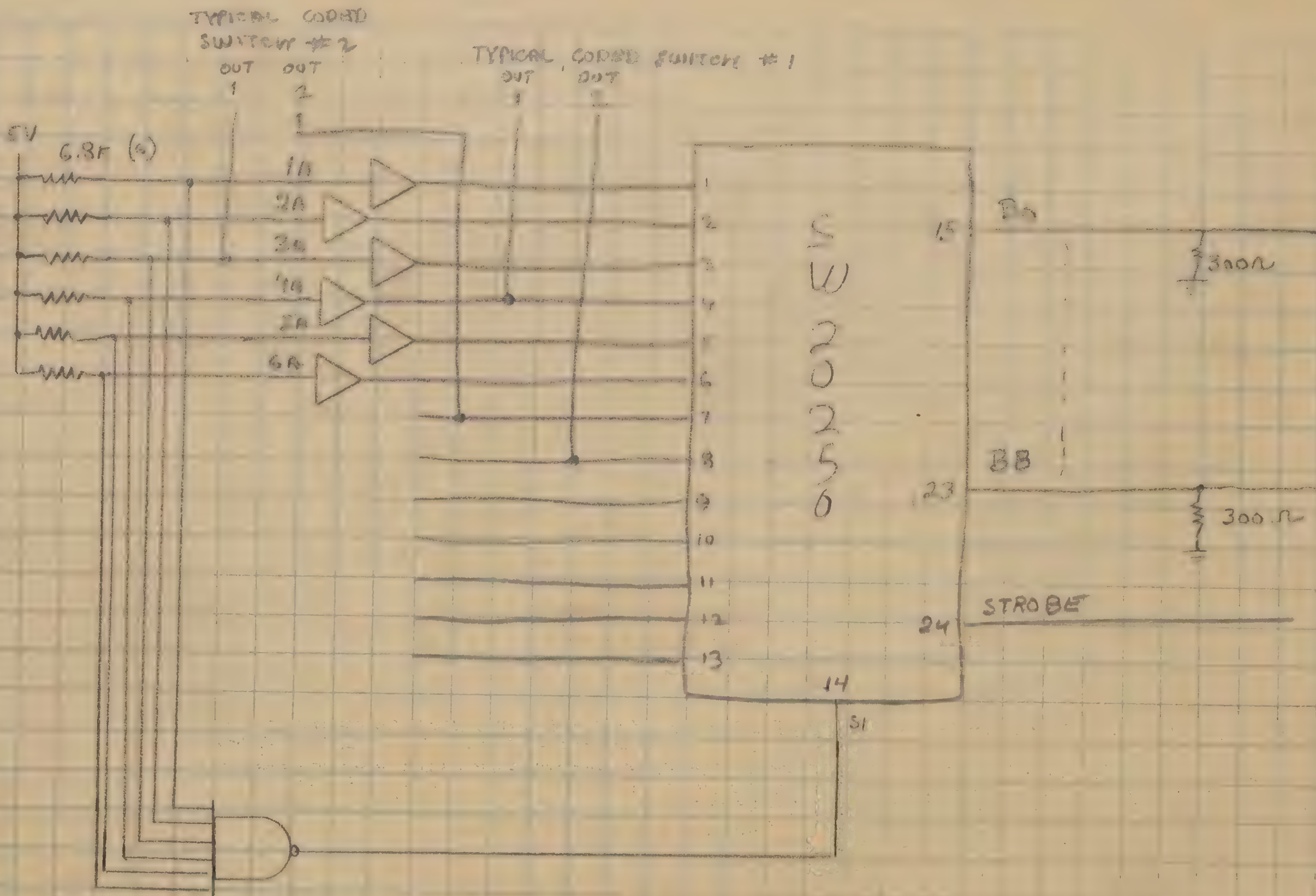



+5
R36
R37
R38
R31
R41
R42
R32
U11
U11
U11
U12
U12
U12
U21
U21
U22
U22
U22
U22
U23
U23
U24
U24
U25
U25
R43
C19
R44
C20
R39
R40
U16-14-8
U17-1
SYNC



COPY AND RELAY DRIVE

GROUP D - MODE 2



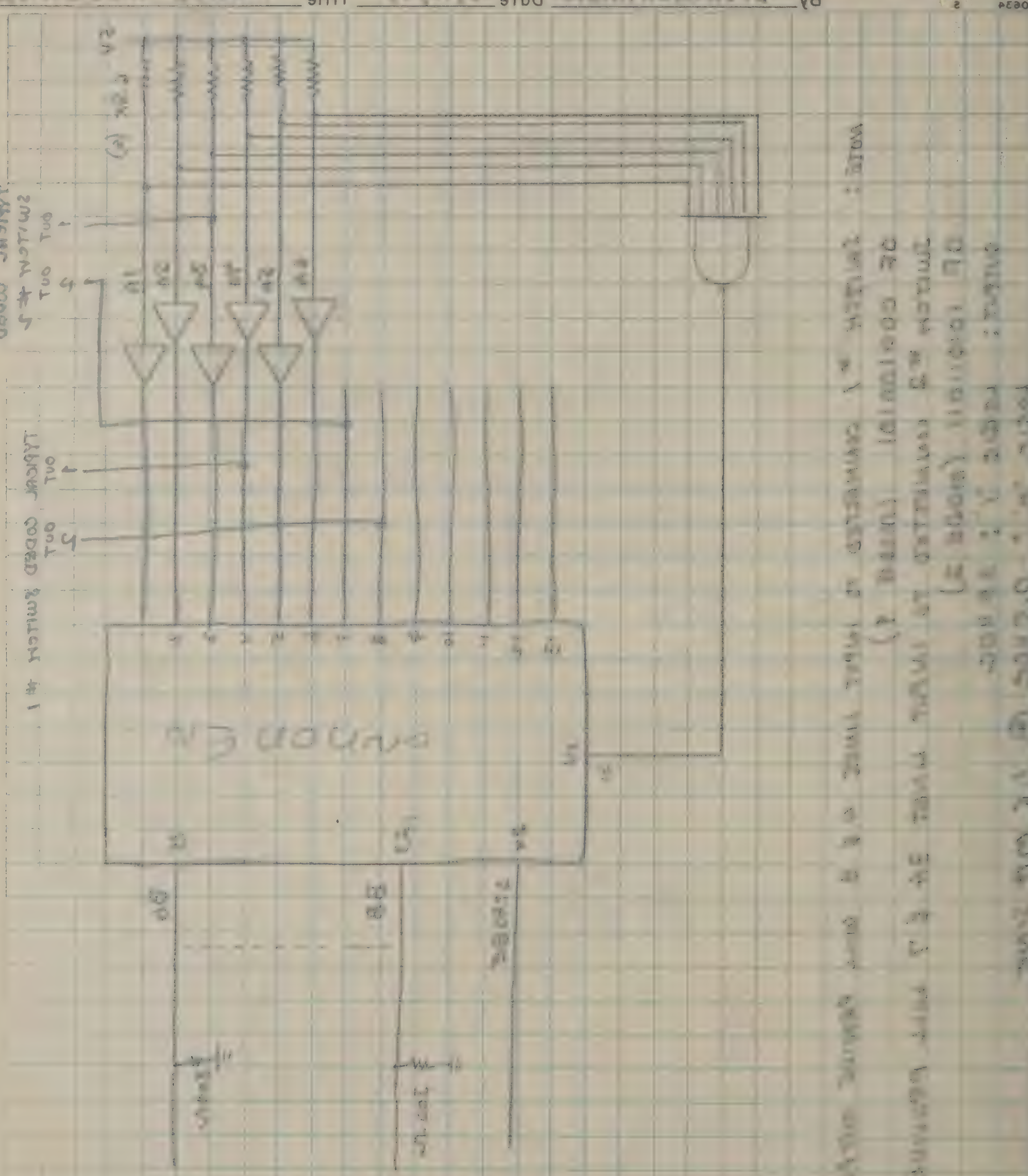
NOTE: SWITCH #1 CONNECTED TO INPUT LINES 4 & 8 WILL PROVIDE OUTPUT CODE OF 000100101 (MODE 1)
SWITCH #2 CONNECTED TO INPUT LINES 3A & 7 WILL PROVIDE OUTPUT CODE OF 10101101 (MODE 2)
OUTPUT: LOGIC "1": 3.5 VDC
LOGIC "0": 0.5 VDC @ 1.6 MA SINK

MICRO SWITCH
D-DATA SHEET

FO-60634

SUBJECT ______ Page ______ of ______

By ______ Date ______ Title ______



MICRO SWITCH SUBJECT Page ___ of ___

D-DATA SHEET

FO-60634 S

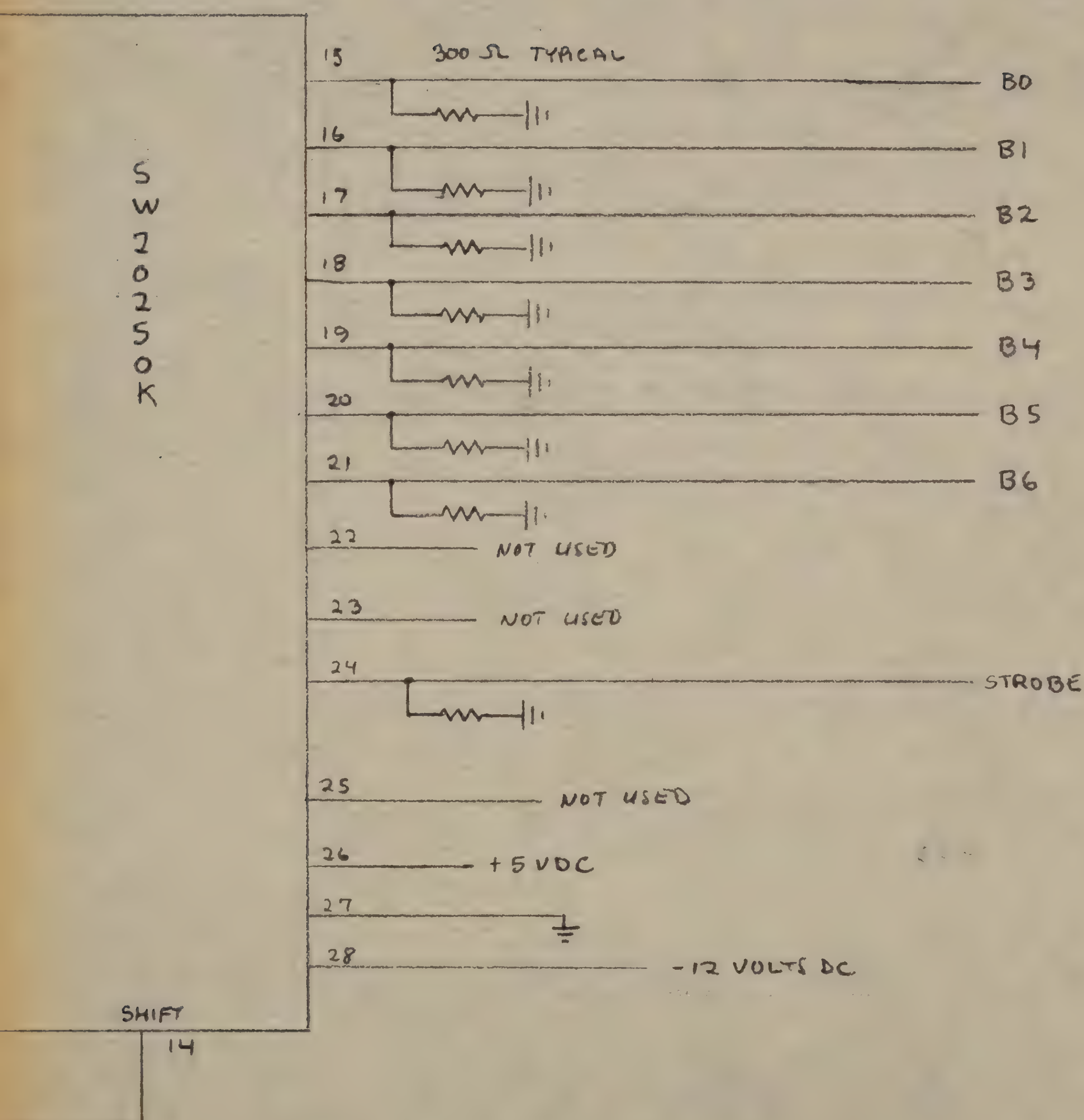
By DALE SCHMERTMANN Date 6/16/77 Title ___

SUGGESTED INPUT PAIRS FOR PARKO ELECTRONICS:

MAIN KEY BOARD 62 KEYS MAX	AUXILIARY KEYBOARD 57 KEYS MAX
1 AND 2	1A AND 2
1 AND 3	1A AND 3
THRU	THRU
1 AND 13	1A AND 13
2 AND 3	2A AND 3
2 AND 4	2A AND 4
THRU	THRU
2 AND 13	2A AND 13
3 AND 4	3A AND 4
THRU	THRU
3 AND 13	3A AND 13
4 AND 5	4A AND 5
THRU	THRU
4 AND 13	4A AND 13
5 AND 6	5A AND 6
THRU	THRU
5 AND 13	5A AND 13
6 AND 7	6A AND 7
THRU	THRU
6 AND 13	6A AND 13
7 AND 8	
THRU	
7 AND 12	

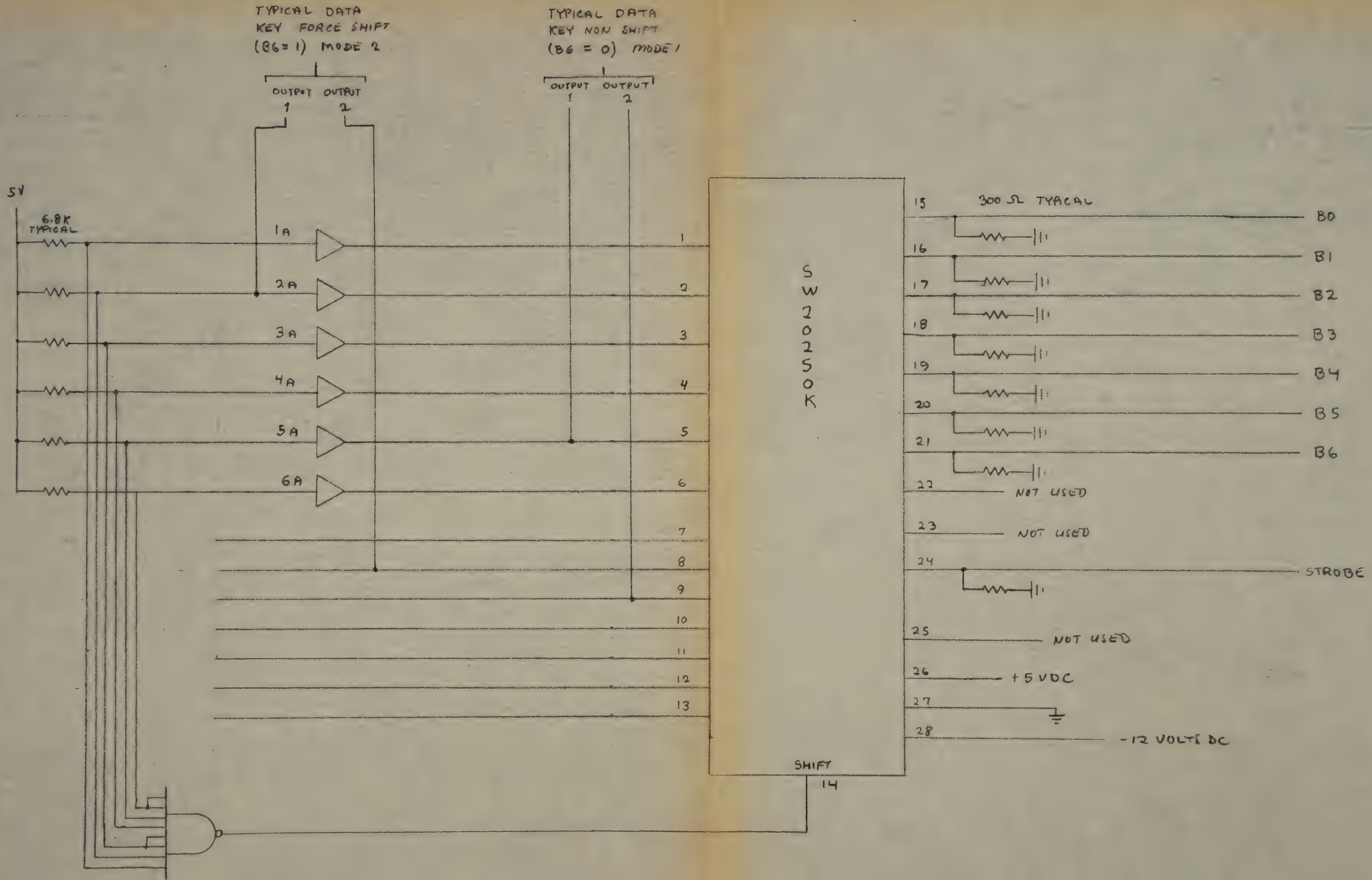
REFER TO ENCLOSED LOGIC DIAGRAM

SEND TO FRANK MULLIN
1467 ROSEHILL DRIVE
RIVERSIDE, CALIF 92507



SUGGESTED CIRCUIT FOR PARKO ELECTRONICS

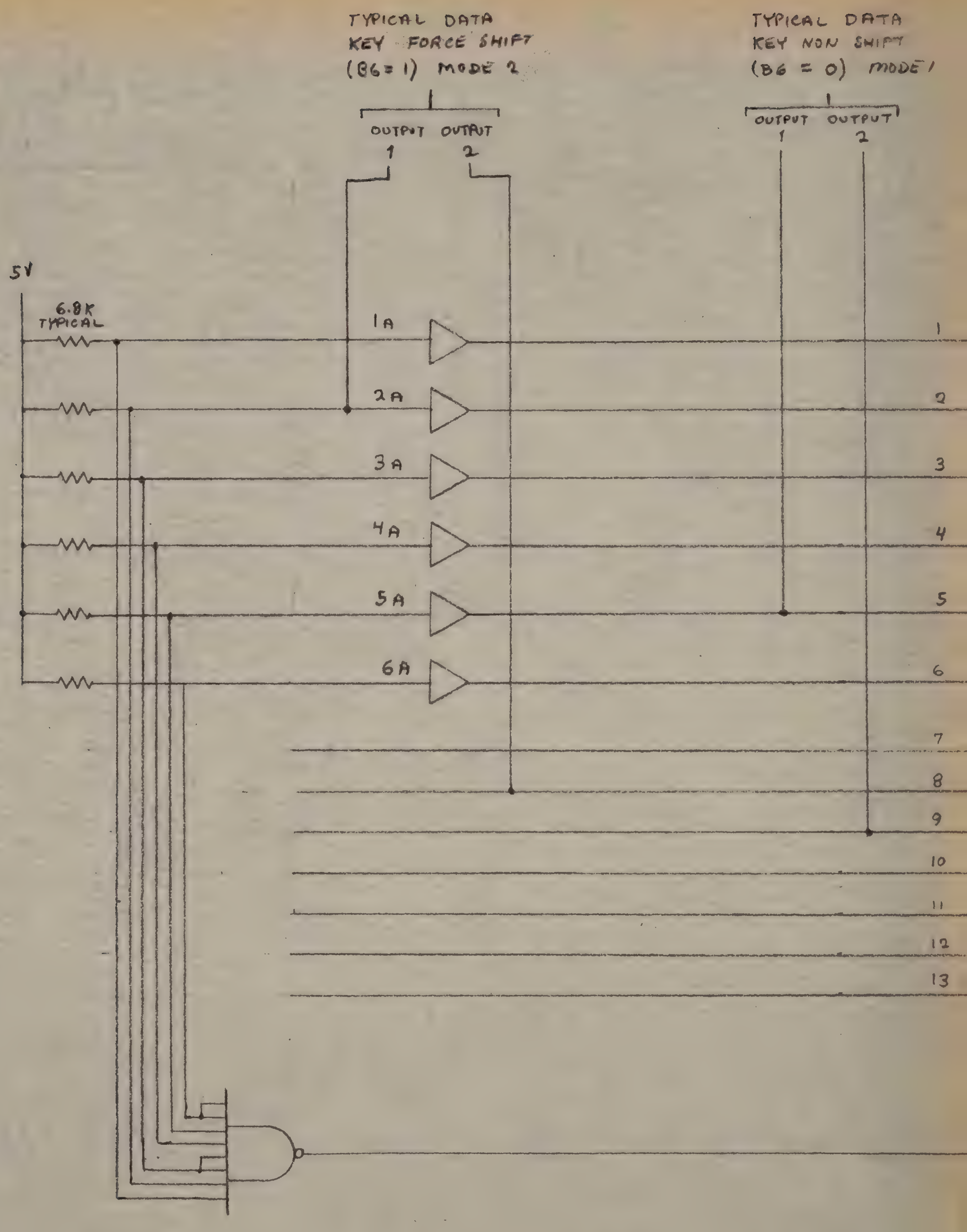
D.E SCHMERTMAN 6/16/77



FOR MR. PARKER

SUGGESTED CIRCUIT FOR PARKO ELECTRONICS

D.E SCHMERTMAN 6/16/77



FOR MR PARKER

GROUP A

49 — STANDARD KEYS (MODE 1)

4 — SPECIAL SHIFT CONTROLS "SHIFT", "SHIFT LOCK" & "SYM."

GROUP B

14 — STANDARD (MODE 2)

GROUP C

12 — STANDARD (MODE 2)

2 — SPECIAL CODE (MODE 2) "EDIT" AND "REPEAT"

GROUP D

6 — STANDARD (MODE 2)

3 SPECIALS: ATTEND/UNATTEND (MODE 2)

COPY W/RELAY (MODE 2)

REMOTE SELECT A & B (MODE 2)

DUAL MODE KEYBOARD ENCODER MASK SPECIFICATION SW-20250

CODING MATRIX *CARDS 01 - 78*

	SW-NO	INPUT PATTERN ABCDEFGHIJKLM	S T	MODE 1 876543210	MODE 2 876543210
01	20250	0011111111111	1	100000001	101000001
02	20250	0101111111111	1	000000010	001000010
03	20250	0110111111111	1	000000011	001000011
04	20250	0111011111111	1	000000100	001000100
05	20250	0111101111111	1	000000101	001000101
06	20250	0111110111111	1	100000110	101000110
07	20250	0111111011111	1	100000111	101000111
08	20250	0111111101111	1	000001000	001001000
09	20250	0111111110111	1	000001001	001001001
10	20250	0111111111011	1	100001010	101001010
11	20250	0111111111101	1	100001011	101001011
12	20250	0111111111110	1	100001100	101001100
13	20250	1001111111111	1	100001101	101001101
14	20250	1010111111111	1	100001110	101001110
15	20250	1011011111111	1	100001111	101001111
16	20250	1011101111111	1	000010000	001010000
17	20250	1011110111111	1	000010001	001010001
18	20250	1011111011111	1	000010010	001010010
19	20250	1011111101111	1	000010011	001010011
20	20250	1011111110111	1	000010100	001010100
21	20250	1011111111011	1	000010101	001010101
22	20250	1011111111101	1	000010110	001010110
23	20250	1011111111110	1	000010111	001010111
24	20250	1100111111111	1	000011000	001011000
25	20250	1101011111111	1	000011001	001011001
26	20250	1101101111111	1	100011010	101011010
27	20250	1101110111111	1	100011011	101011011
28	20250	1101111011111	1	100011100	101011100
29	20250	1101111101111	1	100011101	101011101
30	20250	1101111110111	1	000011110	001011110
31	20250	1101111111011	1	000011111	001011111
32	20250	1101111111101	1	000100000	001100000
33	20250	1101111111110	1	000100001	001100001
34	20250	1110011111111	1	000100010	001100010
35	20250	1110101111111	1	000100011	001100011
36	20250	1110110111111	1	000100100	001100100
37	20250	1110111011111	1	000100101	001100101
38	20250	1110111101111	1	000100110	001100110
39	20250	1110111110111	1	100100111	101100111
40	20250	1110111111011	1	100101000	101101000
41	20250	1110111111101	1	100101001	101101001
42	20250	1110111111110	1	100101010	101101010
43	20250	1111001111111	1	000101011	001101011
44	20250	1111010111111	1	000101100	001101100
45	20250	1111011011111	1	000101101	001101101
46	20250	1111011101111	1	000101110	001101110
47	20250	11110 1110111	1	000101111	001101111
48	20250	1111011111011	1	000110000	001110000
49	20250	1111011111101	1	000110001	001110001
50	20250	1111011111110	1	000110010	001110010
51	20250	1111100111111	1	000110011	001110011
52	20250	1111101011111	1	100110100	101110100
53	20250	1111101101111	1	100110101	101110101
54	20250	1111101110111	1	100110110	101110110
55	20250	1111101111011	1	100110111	101110111
56	20250	1111101111101	1	100111000	101111000
57	20250	1111101111110	1	100111001	101111001
58	20250	1111110011111	1	000111010	001111010
59	20250	1111110101111	1	100111011	101111011
60	20250	1111110110111	1	100111100	101111100
61	20250	1111110111011	1	100111101	101111101
62	20250	1111110111101	1	100111110	101111110
63	20250	1111110111110	1	010000001	011000001
64	20250	1111111001111	1	010000010	011000010
65	20250	1111111010111	1	010000011	011000011
66	20250	1111111011011	1	010000100	011000100
67	20250	1111111011101	1	010000101	011000101
68	20250	1111111011110	1	010000110	011000110
69	20250	1111111100111	1	010000111	011000111
70	20250	1111111101011	1	010001000	011001000
71	20250	1111111101101	1	010001001	011001001
72	20250	1111111101110	1	010001010	011001010
73	20250	1111111110011	1	010001011	011001011
74	20250	1111111110101	1	010001100	011001100
75	20250	1111111110110	1	010001101	011001101
76	20250	1111111111001	1	010001110	011001110
77	20250	1111111111010	1	010001111	011001111
78	20250	1111111111100	1	010010000	011010000

INPUT RESISTOR AND STROBE OPTIONS

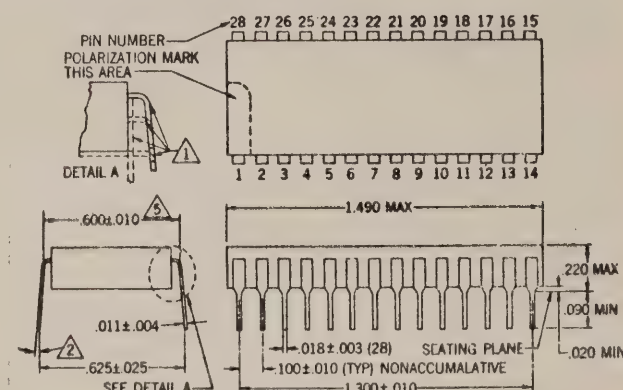
	SW-NO	ABCDEFGHIJKLM	SHIFT	STROBE
RS	20250	PPPPPPPPPPPPP	P	A

PIN ASSIGNMENTS AND OPTION NOTES SW-20250

CHIP FUNCTION	CHIP PAD NAME	PIN NO.	NOTES
KEY INPUT A	IA	1	INPUT RESISTOR CONNECTED TO +5 VOLTS
B	IB	2	INPUT RESISTOR CONNECTED TO +5 VOLTS
C	IC	3	INPUT RESISTOR CONNECTED TO +5 VOLTS
D	ID	4	INPUT RESISTOR CONNECTED TO +5 VOLTS
E	IE	5	INPUT RESISTOR CONNECTED TO +5 VOLTS
F	IF	6	INPUT RESISTOR CONNECTED TO +5 VOLTS
G	IG	7	INPUT RESISTOR CONNECTED TO +5 VOLTS
H	IH	8	INPUT RESISTOR CONNECTED TO +5 VOLTS
I	II	9	INPUT RESISTOR CONNECTED TO +5 VOLTS
J	IJ	10	INPUT RESISTOR CONNECTED TO +5 VOLTS
K	IK	11	INPUT RESISTOR CONNECTED TO +5 VOLTS
L	IL	12	INPUT RESISTOR CONNECTED TO +5 VOLTS
M	IM	13	INPUT RESISTOR CONNECTED TO +5 VOLTS
SHIFT INPUT1	S1	14	INPUT RESISTOR CONNECTED TO +5 VOLTS
DATA OUTPUT 0	B0	15	FLIP FLOP USED
1	B1	16	FLIP FLOP USED
2	B2	17	FLIP FLOP USED
3	B3	18	FLIP FLOP USED
4	B4	19	FLIP FLOP USED
5	B5	20	FLIP FLOP USED
6	B6	21	FLIP FLOP USED
7	B7	22	FLIP FLOP USED
8	B8	23	FLIP FLOP USED
STROBE OUTPUT	ST	24	A (DC)
STROBE ENABLE	SE	25	LOGIC 1 TO ENABLE
+5 VOLT SUPPLY	+V	26	4.5 TO 6.5 VOLTS
GROUND	OV	27	
-12 VOLT SUPPLY	-V	28	20% MOS BIAS

NOTE--- LOGIC 0 ON SHIFT INPUT CORRESPONDS TO MODE 1 OUTPUT

NOTES:
1. Leads may egress from top, side or bottom of package
2. Angle may be 0° to 15°
3. Spacing between exposed conductors shall be .015 min
4. Conductive, accessible, areas on top of package shall be electrically isolated from pins
5. Dimension between center line of leads when formed parallel



IC MOS DUAL PLASTIC	SW-20250-K		
IC MOS DUAL CERAMIC	SW-20250		
B	DWG REV	34/26	RJV
B	SW-20250-K ADDED	DR 1365	RJV
A	WAS ADV REL		

UNLESS NOTED TOLERANCES ARE: ONE PLACE ±.030; TWO PLACE ±.015; THREE PLACE ±.005; ANGLES; RAW MATERIAL - COMMERCIAL STANDARD

DIMENSIONS ARE IN INCHES AND ARE TO BE MET BEFORE PROTECTIVE COATINGS ARE APPLIED

TITLE INTEGRATED CIRCUIT-MOS KEYBOARD ENCODER (DUAL MODE)

MATERIAL PERFORMANCE REQUIREMENTS PER CS 044 29

DRAWN	JK	1 MAR 73
DFTG CHECK	LSD	7 MAR 73
	OLL	5 MAR 73

MICRO SWITCH
FREEPORT ILLINOIS U.S.A.
A DIVISION OF HONEYWELL

DO NOT SCALE PRINT

RELEASE NO PR-2997

DRAWING NUMBER SW-20250 ★

SHEET X 3

ZOOM BOARD

P.C. BOARD CONNECTOR		P.C. BOARD WIRE #		DESTINATION
2 ~~1~~	—	TO (1)	—	TRACK BALL +X
1 2	—	" (2)		" " −X
4 ~~3~~	—	SPARE		
3 ~~4~~	—	" (3)		" " GND
6 ~~5~~	—	SPARE		
5 ~~6~~	—	" (4)		" " +Y
8 ~~7~~	—	" (5)		" " −Y
7 ~~8~~	—	SPARE		
10 ~~9~~	—	TO ZOOM OUTPUT		Z0 ✓
9 ~~10~~	—	" " "		Z1 ✓
12 ~~11~~	—	" " "		Z2 ✓
11 ~~12~~	—	" " "		Z3 ✓
14 ~~13~~	—	" " "		GND ✓
13 ~~14~~	—	" " "		ZOPS ✓
16 ~~15~~	—	" " "		GND ✓
15 ~~16~~	—	SPARE		
18 ~~17~~	—	SPARE		
17 ~~18~~		SPARE		
20 ~~19~~	—	POWER GND		
19 ~~20~~	—	+5 ✓	TO WIRE #(6)	TRACK BALL +5V ✓

KEY CODES

0	=	Y1 X1	—	0000 ✓
1	=	Y1 X2	—	0001 ✓
2	=	Y1 X3	—	0010 ✓
3	=	Y1 X4	—	0011 ✓
4	=	Y2 X1	—	0100 ✓
5	=	Y2 X2	—	0101 ✓
6	=	Y2 X3	—	0110 ✓
7	=	Y2 X4	—	0111 ✓
8	=	Y3 X1	—	1000 ✓
9	=	Y3 X2	—	1001 ✓
ZOOM	=	Y3 X3	—	1010 ✓
HOME	=	Y3 X4	—	1011 ✓

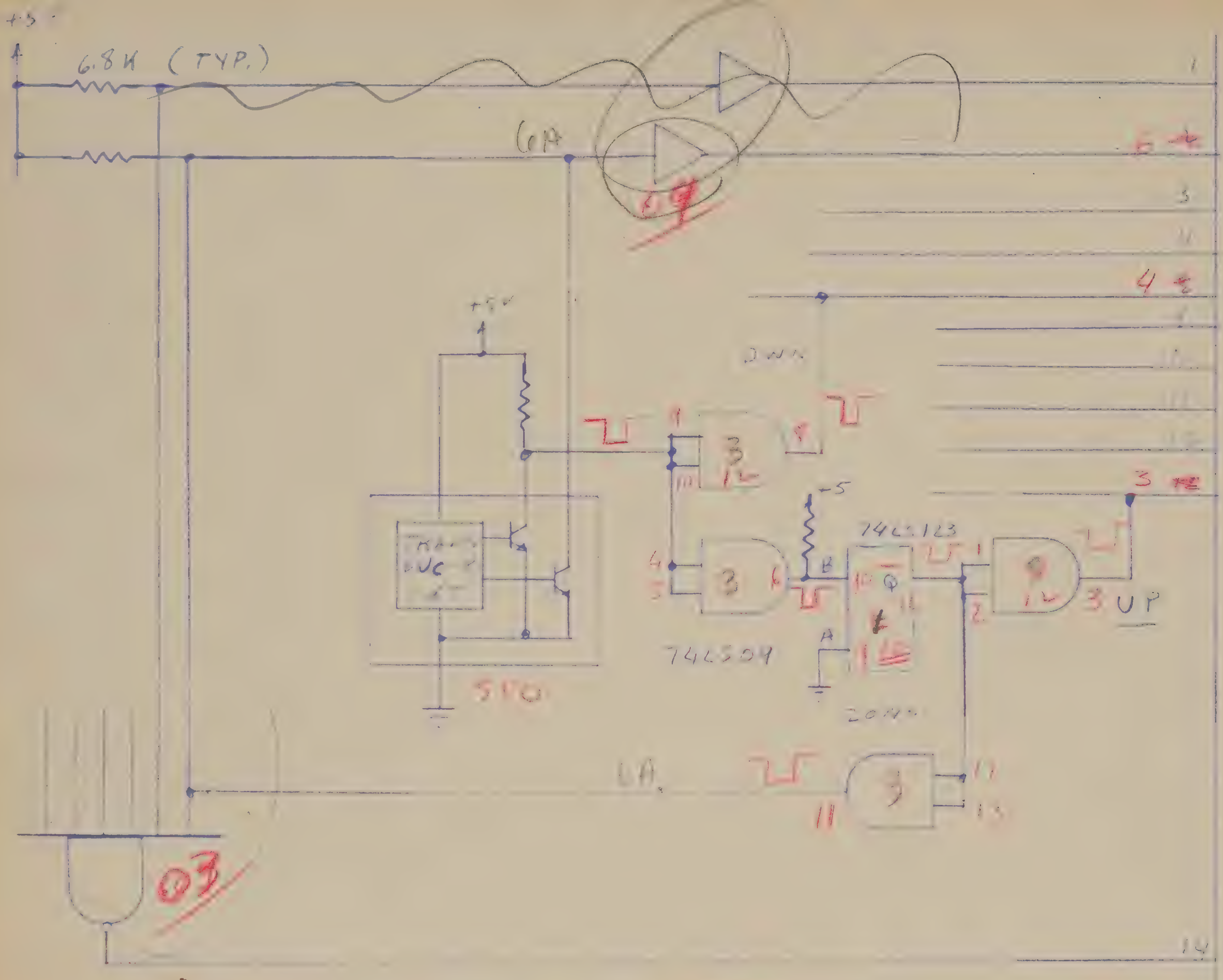
This circuit breadboarded
6-30-77
checks ok.

DIMENSIONS ARE IN INCHES AND AFTER PLATING	DR [illegible]
	CHK
TOLERANCES (unless otherwise specified)	DSGN
	PROJ
.X ±.1 .XX ±.03 .XXX ±.010 ANGLES ±0.5°	REL
	APPROVED
MACH SURF ✓	APPROVED
	DO NOT SCALE DRAWING

Parko
ELECTRONICS COMPANY INC., SANTA ANA, CALIF

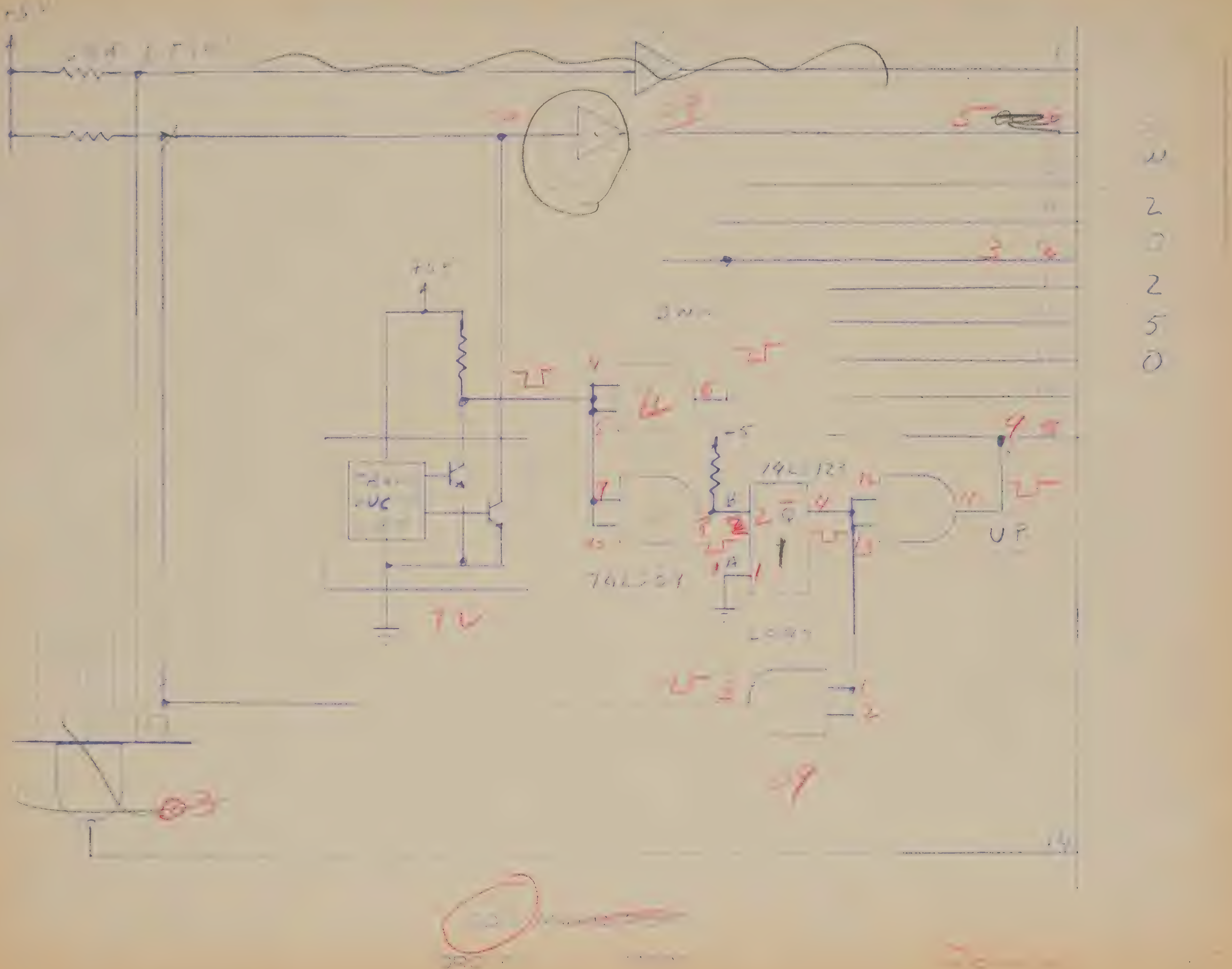
[illegible] 20MM Keyboard

CODE IDENT NO	SIZE		REV
13979	A		
SCALE		SHEET OF	



+5
6.8K (TYP.)
6A
6A
+5V
DWN
74LS123
74LS04
+5
B
A
Q
UP
3UP
4
3
4
5
6
1
2
11
12
13
11
3
4
14
510
LA
03

W20250



+5V
74LS123
74LS04
UP
DWN
-5
32 2250

Instruction Sheet

SD SOLID STATE SWITCH MODULE REPLACEMENT AND RECOMMENDED WAVE SOLDERING TECHNIQUE

SWITCH BUTTON REMOVAL

1. Remove the button from the module being replaced and as many adjacent buttons as required to furnish adequate work space. The buttons can be removed by pulling upward or by prying upward, with a padded tool, from their under surface.

   We recommend using our "Keytop Puller." Refer to figure 1. This unique device makes the job of pulling buttons off the keyboard plungers easier. Order as SW-11485.

NOTE

Remove buttons from alternate action modules only when they are in the free position. Failure to do this will result in damage to the module.

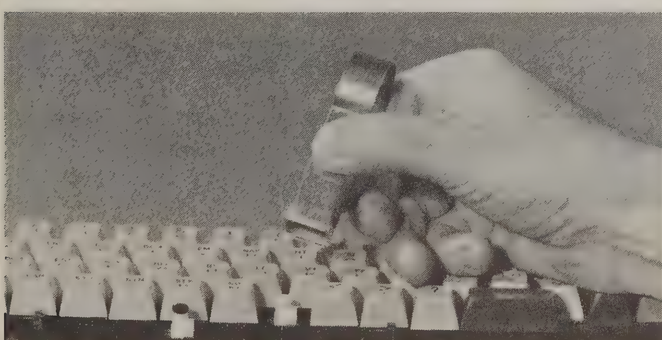


Figure 1
BUTTON REMOVAL

SWITCH MODULE REMOVAL

2. Refer to figure 2. Unsolder the four terminals of the lead frame package from the termination board, using a 750°F controlled temperature iron. When unsoldering the terminals, use a solder removal tool to remove all solder from the pin holes in the printed circuit board.

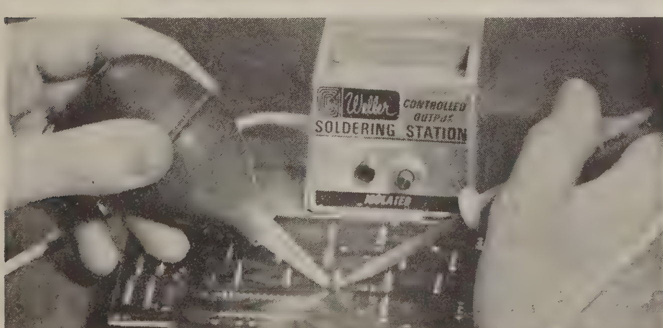


Figure 2
UNSOLDERING TERMINALS

3. Refer to figure 3. Insert module removal tools (Order as SD-10101) at each end of the module.

Figure 3
INSERTING REMOVAL TOOLS

4. Refer to figure 4. With the module removal tools in position, grip the switch module with a pair of pliers and pull straight out.

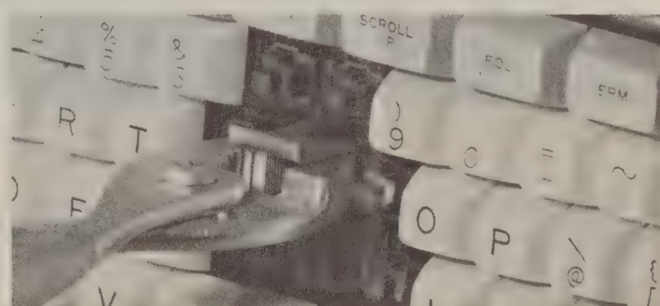


Figure 4
MODULE REMOVAL

SWITCH MODULE INSTALLATION

5. Replace with new module. Take care to orient switch properly and observe that solder terminals are through the printed circuit board prior to snapping in place.

6. Solder the new switch terminals using 60/40 rosin core solder employing a 750°F controlled temperature 1/8" chisel tip soldering iron.

   CAUTION: The solder tip should *never* be held on the terminal for over 4 seconds.

7. The solder connections may be cleaned with a mild solvent. However, take care not to contact the switch with the solvent.

8. Reassemble the buttons on the switch modules. When work has been completed, perform a visual check to see that the correct buttons are returned to the correct modules.

TECHNIQUE FOR WAVE SOLDERING SD SWITCH MODULES

1. No attempt should be made to wave solder any SD module into a P.C. board without the support of a rigid panel. See Figure 5 for an example of a panel we recommend. It is constructed of .050'', half-hard steel and is designed especially for the insertion of SD modules.

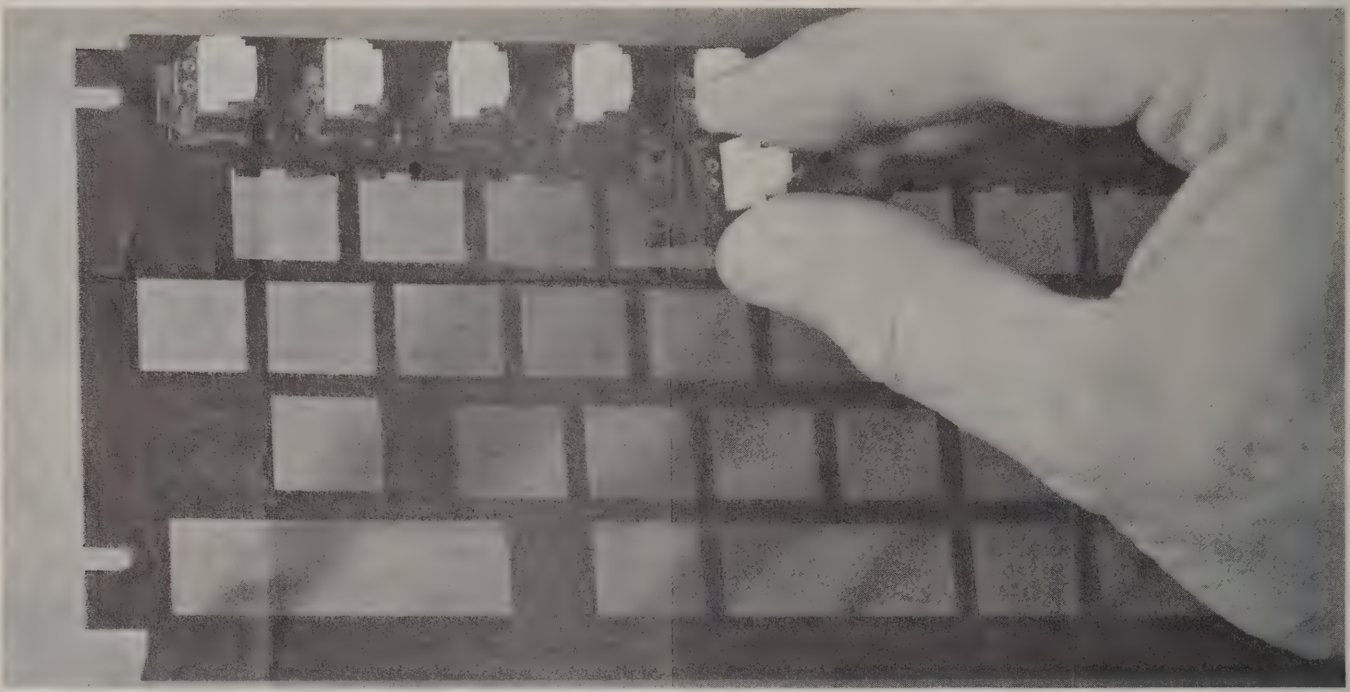


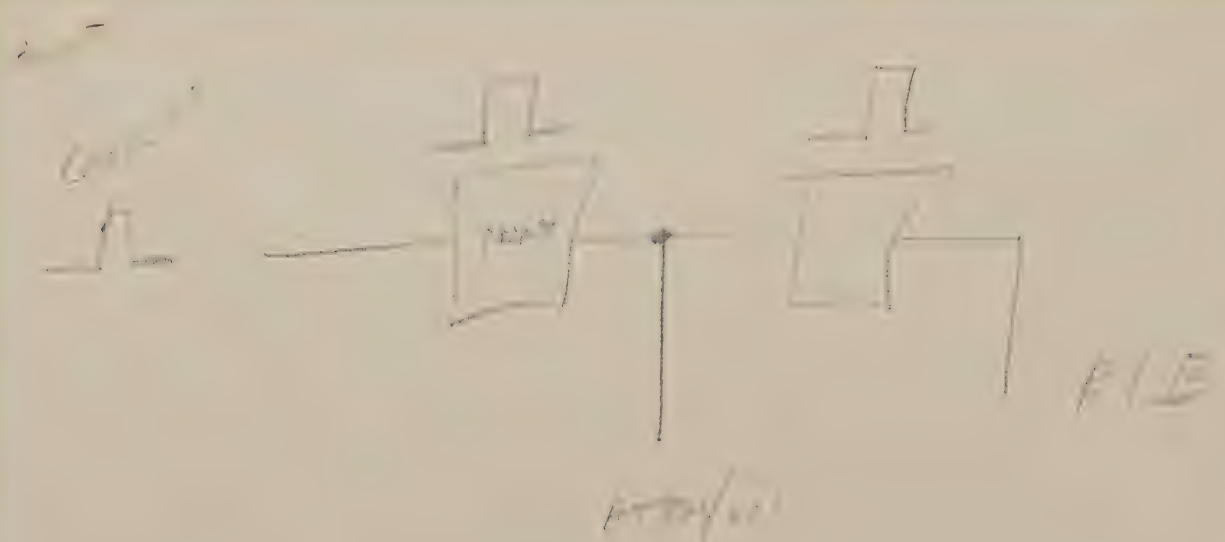
Figure 5
RECOMMENDED MODULE SUPPORT

2. Wave soldering should be accomplished using **only** a mildly activated water white rosin flux. **Do not** use water soluble fluxes.
3. Pre-heat . . . the temperature on the top (component) side of the P.C. board should be 200°F prior to the actual wave soldering operation.
4. The solder temperature of the wave solder pot should be maintained at 500°F.
5. Maintain a **minimum** conveyor speed of 4 feet per minute. Select the conveyor speed that will give full solder fillets and a minimum of solder bridging and icicles.
6. We recommend using Loncoterge 446, manufactured by the London Chemical Company, in the aqueous cleaning system. Loncoterge 446 is a liquid concentrate that is added to water to remove the **flux residue.**
7. The average field-use concentrations of 446 by application are:

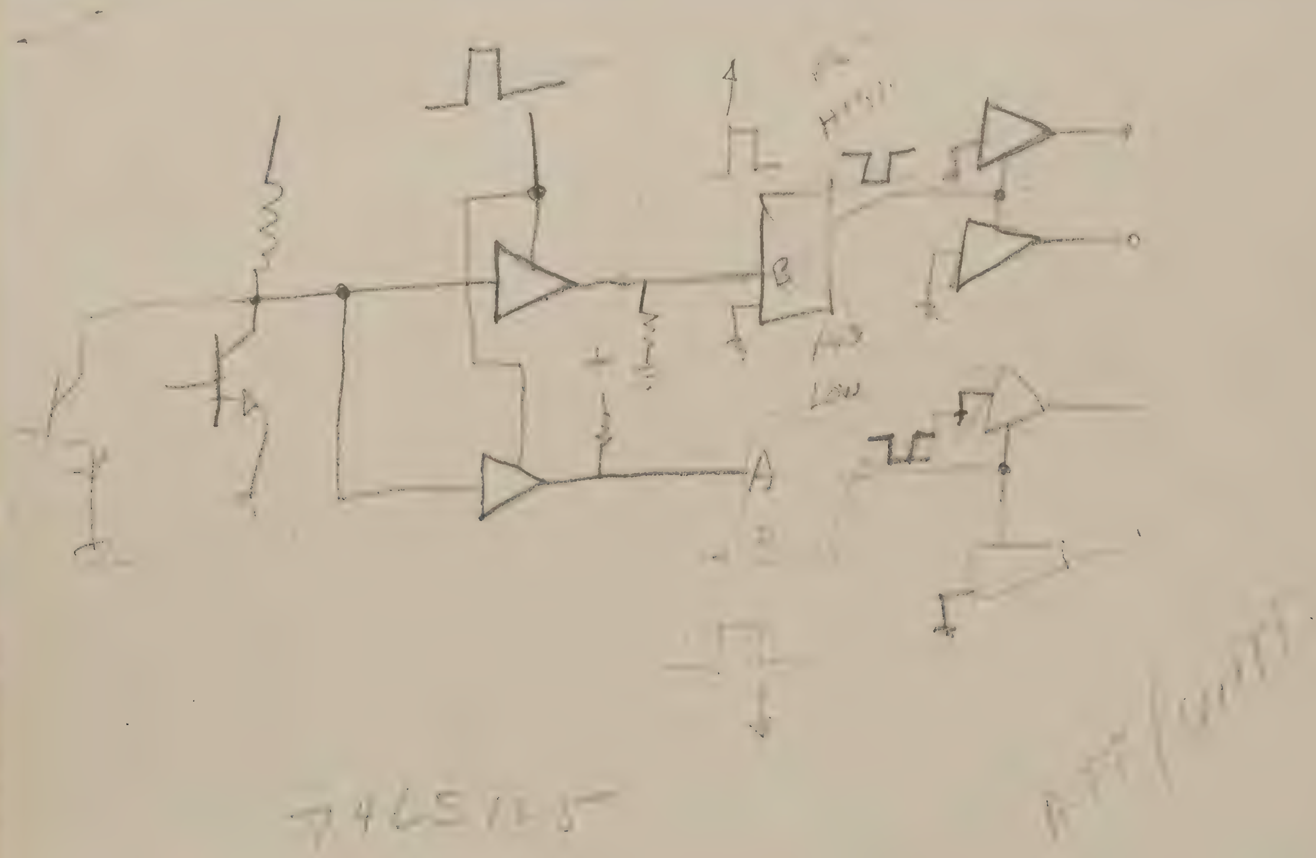
   4-8% by volume in water in automatic "in-line" spray cleaners. Solution temperature 130-150°F.
   5-10% by volume in water in dip tanks heated to 130-150°F.
   5-10% by volume in water in converted dishwaters.
8. A thorough water rinsing is necessary for complete removal of all contaminates from the printed circuit assemblies. We recommend a spray water rinse at 120 psi pressure.
9. Dry the printed circuit assembly (without buttons) after cleaning in an oven at 160°F for 2 hours min.
10. **CAUTION:** If other cleaning methods are selected that use Fluorocarbons or Trichlorethelene for the removal of flux residue, all precautions should be taken to prevent the liquid from coming in contact with the SD switch modules.

MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

IN CANADA: 740 Ellesmere Road, Scarborough, Ontario.
HONEYWELL INTERNATIONAL: Sales and service offices in all principal cities of the world.



A/B


A
B
High
Low

.1 .1

.760

.2 44

3,84

.574

2,32

TD.66

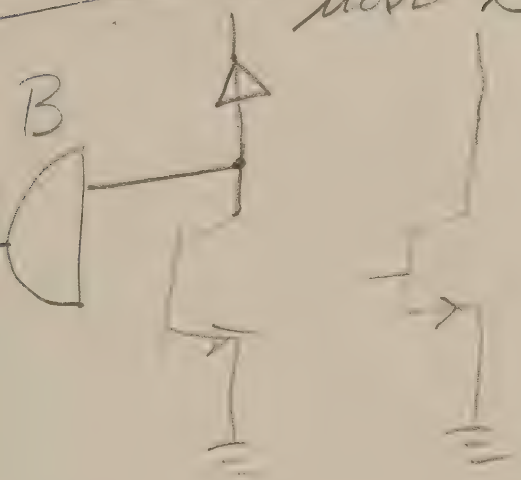
6/13 MODE 1

A

49

MODE 2 F & E COMMON

B



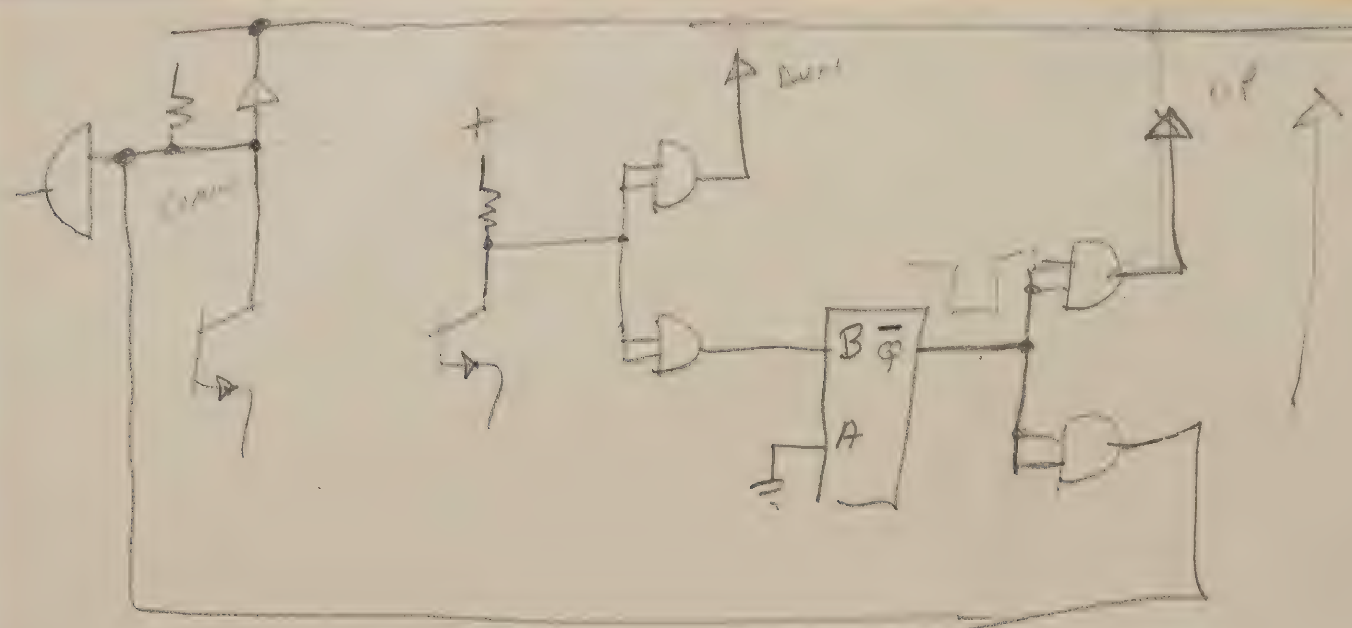
TWO COMMON

14 KEYS

C 12 SAME AS B

SWITCHES

MODE 2



MODE 2

EDIT & REPEAT

C

D. 6 SWITCHES SAME AS B

MOD 2

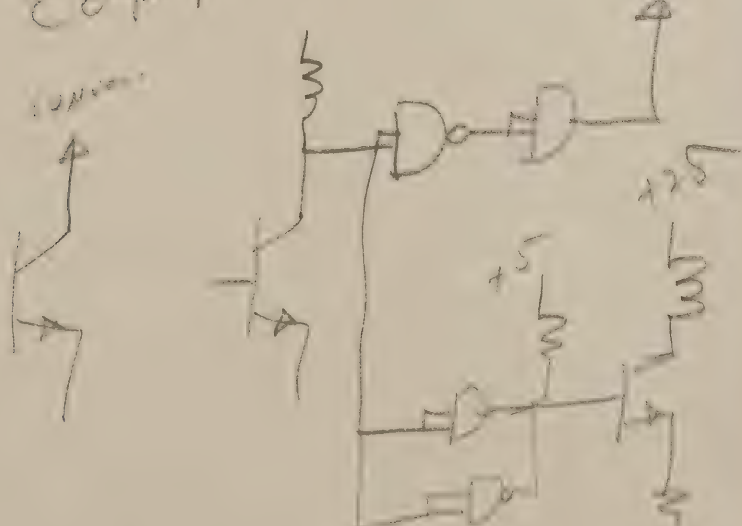
REMOTE SELECT SEE

SEPARATE PAGE

ATTEND / UNATTEND SEE

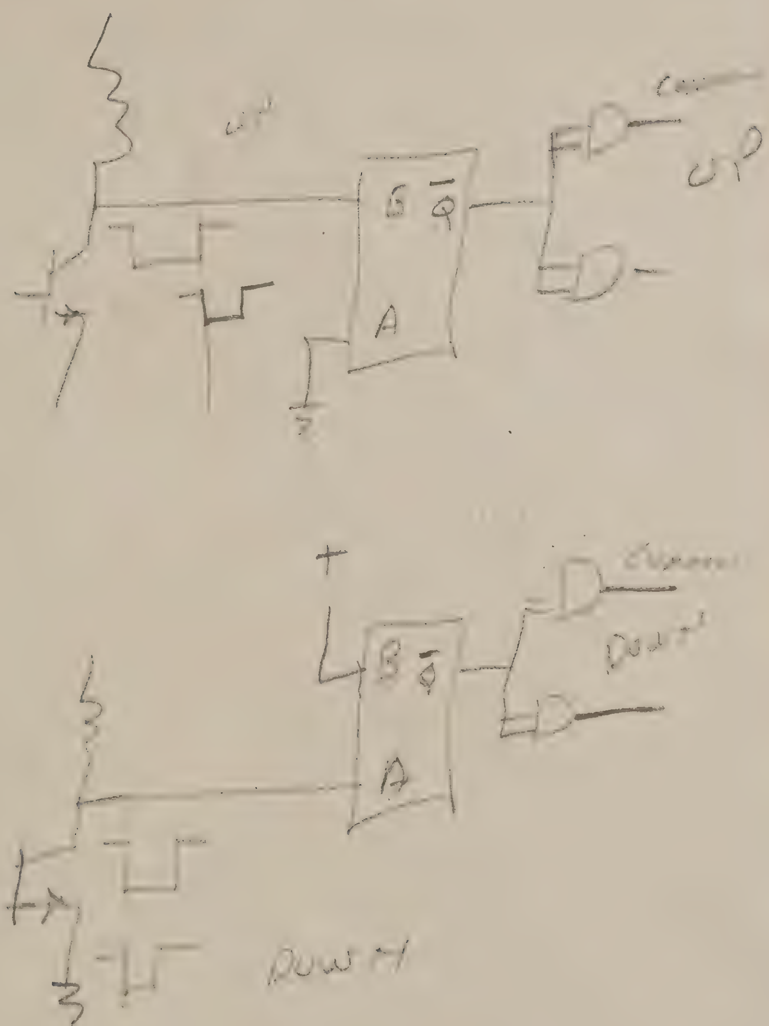
SEPARATE PAGE

COPY



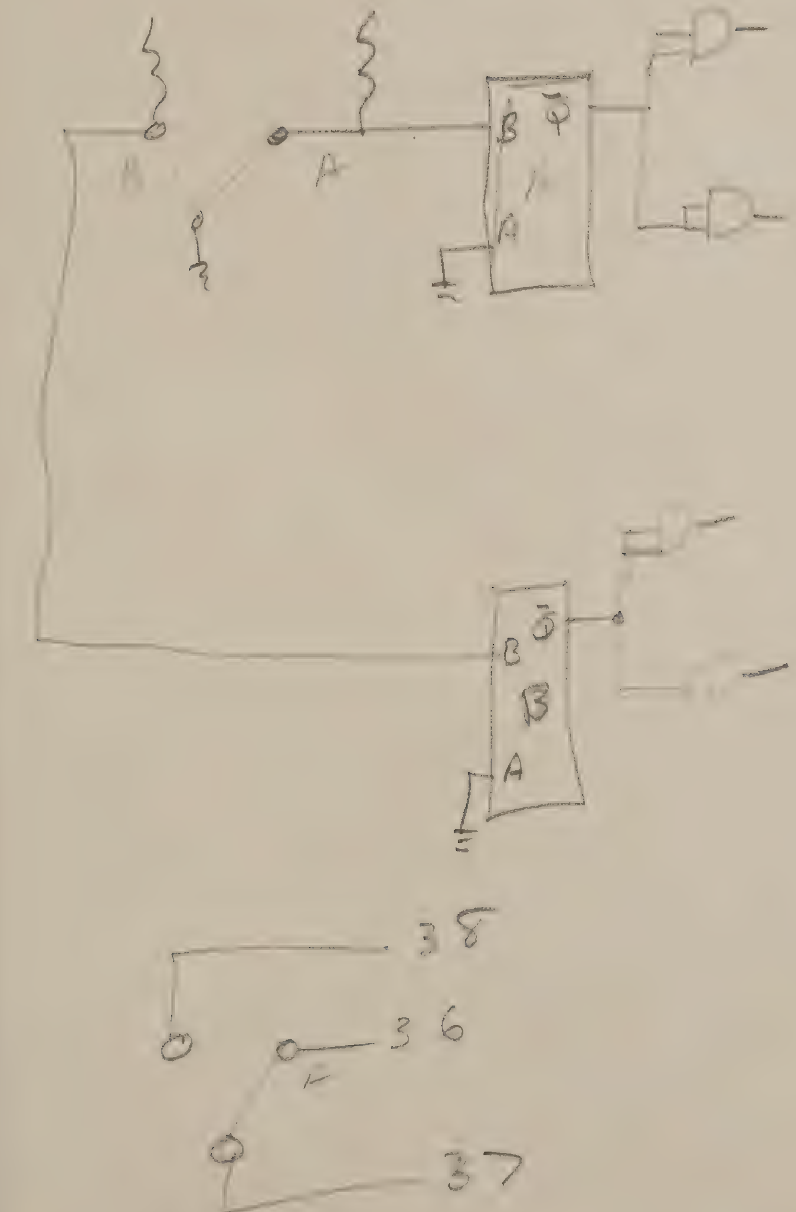
MODE 2

ATTACH/ UNATTACHED

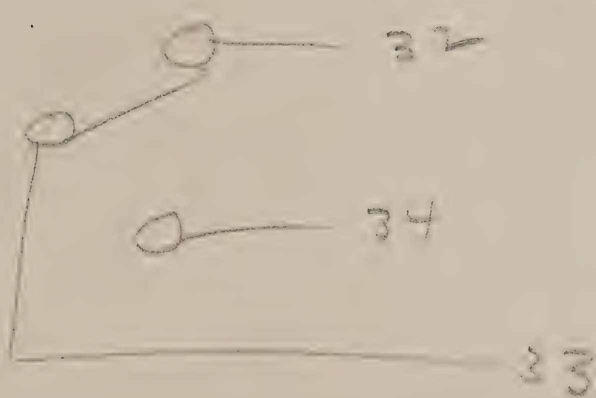


MODE 2

REMOTE SELECT MODE
D A / B 2



D. REMOTE ENABLE
LC TV
AMT SW...



PINS = .195

12 CHT MODEL 1360

PLUG - 03-04-2121 [illegible]

RECEPT. - 03-08-1176

.775 x .737

MOUSE

POWER

J12

1 } +28 IN
2

3 +28 ~~OUT REMOTE~~ 2nd

4 } +28 RET
5

6 +28 RET - REMOTE 2nd

7 +5V

8 +5V RET.

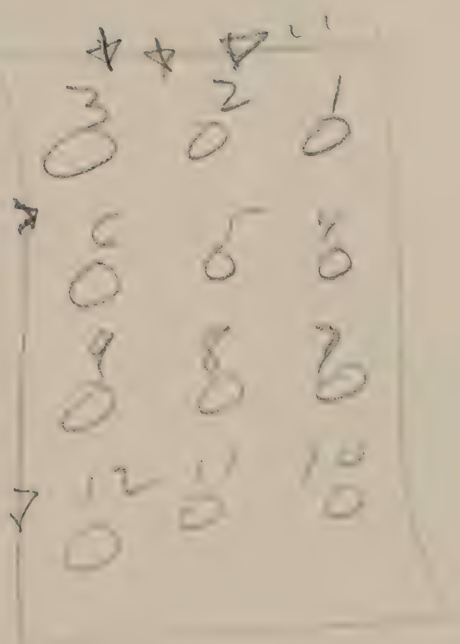
10 -12 VIN

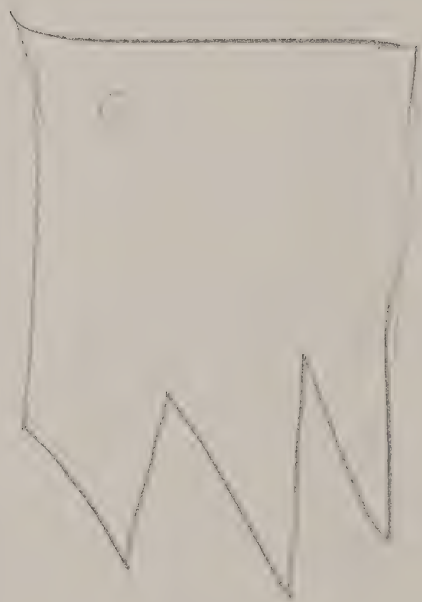
11 -12 RET.

9 A
~~RELAY~~ MONITOR ATS
12 B

635 - 7210 CYT

O N - O - S - - - 5


3 2 1
6 5 4
9 8 7
12 11 10



JAN-13-78

VISIT TO INTERSTATE.

DISTANCE BETWEEN P.C. BOARDS .5"

CLEARANCE BETWEEN PCB-2 AND BOTTOM OF CASE - 1.00.

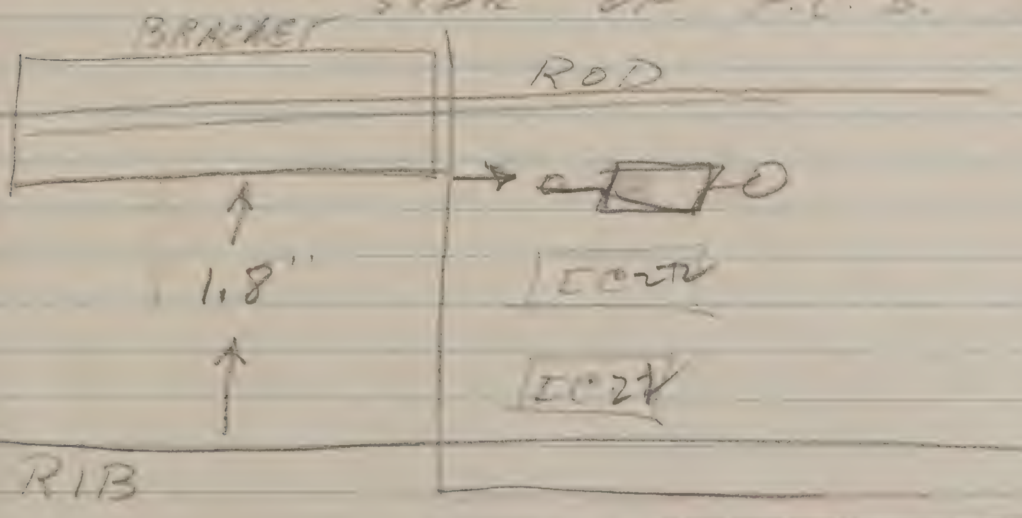
CONNECTORS AT END OF PC BOARD
.75" HIGH

CLEARANCE TO BOTTOM .25"

CONNECTORS AT .6 FROM END OF
BOARD

CONNECTORS ARE 40PIN 3M [illegible]
WITH SCREW MOUNTS

SIDE OF P.C.B.



✓ DEBOUNCE ATT/UNATT AND REMOTE SEL A-B

✓ DEBOUNCE BOTH ENCODERS FOR SWIT/INDICA.

✓ INCORPORATE EDIT & REPEAT CKT CHANGES

1,500.00
8.00

P.C. BOARD #1

WIRE #		DESTINATION		
1	—	CONN C - 21		+5VDC
2	—	" 22		
3	—	" 23		
4	—	" 18		GND
5	—	" 19		
6	—	" 20		
7	—	" 17		-12VDC
8	—	CONN A - 1	- AS 0	
9	—	" 2	- AS 1	
10	—	" 3	- AS 2	
11	—	" 4	- AS 3	
12	—	" 5	- AS 4	
13	—	" 6	- AS 5	
14	—	" 7	- AS 6	
15	—	" 8	- SYM	
16	—	" 9	- GND	
17	—	" 10	- CORS	
18	—	" 11	- GND	
19	—	+28VDC		
20	—	GND (28VDC)		
21	—	CONN B — 39 -		[illegible]
22	—	" -40 -		
23	—	REMOTE SELECT - A		S86
24	—	REMOTE " - GND		
25	—	" " - B		
26	—	ATT —		S87 A?
27	—	UNATT —		
28	—	MCLR - PCB-2		

1

Conn – C P.C.B. #2

1 – IØ	– 1	✓
2 – I_1	– 2	✓
3 – I_2	– 3	✓
4 – I3	– 4	✓
5 – I4	– 5	✓
6 – I5	– 6	✓
7 – KEY O/F	– 7	✓
8 – GND	– 8	✓
9 – NDRDY	– 9	✓
10 – GND	– 10	✓
38 – GND	– 11	✓
39 – MCLR	– 12	✓
40 – GND	– 13	✓
11 – +5V	– 14	✓
12 – +5V	– 15	✓
13 – +5V ✓	– 16	✓

CONN – A –

12 – FFØ	– 17	✓
13 – FF1	– 18	✓
14 – FF2	– 19	✓
15 – FF3	– 20	✓
16 – GND	– 21	✓
17 – FFORS	– 22	✓
18 – GND	– 23	✓
19 – CFØ	– 24	✓
20 – CF1	– 25	✓
21 – CF2	– 26	✓
22 – CF3	– 27	✓
23 – THØ	– 28	✓
24 – TH1	– 29	✓
25 – TH2	– 30	✓
26 – TH3	– 31	✓
27 – GND	– 32	✓
28 – CFORS	– 33	✓
29 – GND	– 34	✓

–

2/

THUMBWHEEL TB2

A	— —	35 ✓
B	— —	36 ✓
C	— —	37 ✓
D	— —	38 ✓

SEE WIRE 97 FOR GND ✓

CHA-FUNT-SW-

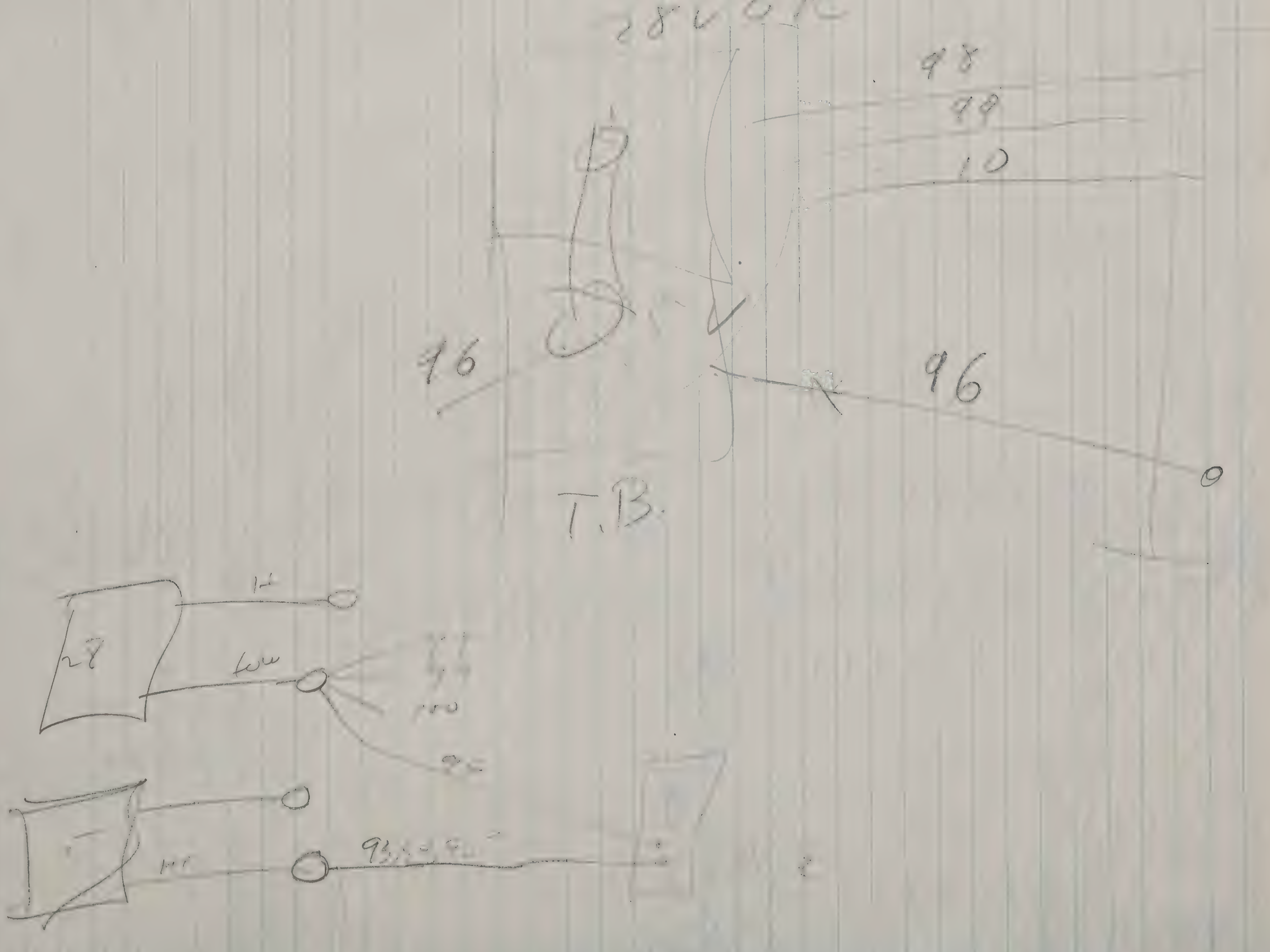
Y1	— —	39 ✓
Y2	— —	40 ✓
Y3	— —	41 ✓
Y4	— —	42 ✓
X1	— —	43 ✓
X2	— —	44 ✓
X3	— —	45 ✓
X4	— —	46 ✓

THUMWHEEL DECODED
OUT TO CF INDICATORS

BIT				
0	—	47	RIGHT	✓
1	—	48		✓
2	—	49		✓
3	—	50		✓
4	—	51	TO	✓
5	—	52		✓
6	—	53		✓
7	—	54		✓
8	—	55		✓
9	—	56	LEFT	✓

CHA-FUNC.
INDICA. FROM RIGHT TO LEFT
TB2

CF	ON (AMB)	OFF (CYAN)
0 —	57 ✓	58 ✓
1 —	59 ✓	60 ✓
2 —	61 ✓	62 ✓
3 —	63 ✓	64 ✓
4 —	65 ✓	66
5 —	67 ✓	68 ✓
6 —	69 ✓	70 ✓


98
99
10
16
96
T.B.

CHAN - FUNC - (CONT)

C.F		ON	OFF
7	—	71 ✓	72 ✓
8	—	73 ✓	74 ✓
9	—	75 ✓	76 ✓
10	—	77 ✓	78 ✓
11	—	79 ✓	80 ✓
12	—	81 ✓	82 ✓
13	—	83 ✓	84 ✓
14	—	85 ✓	86 ✓
15	—	87 ✓	88 ✓

MON. A — 89 ✓
" B 90 ✓
ATT. } SWITCH 91 ✓ } PCB 1
UNATT } — 92 ✓

~~COMM. C~~
14 GND } — 93 ✓ TB1
15 GND } (+5) — 94 ✓
16 GND } — 95 ✓

GND (COM 28) — 96 ✓

THUMBWHEEL
SW-GND — 97 ✓

GND FOR 28V SYSTEM — 98 ✓
" " " 99 ✓
" " " 100 ✓

28V POWER 101 ✓

TB 1 ([illegible])

+ 5

− 12

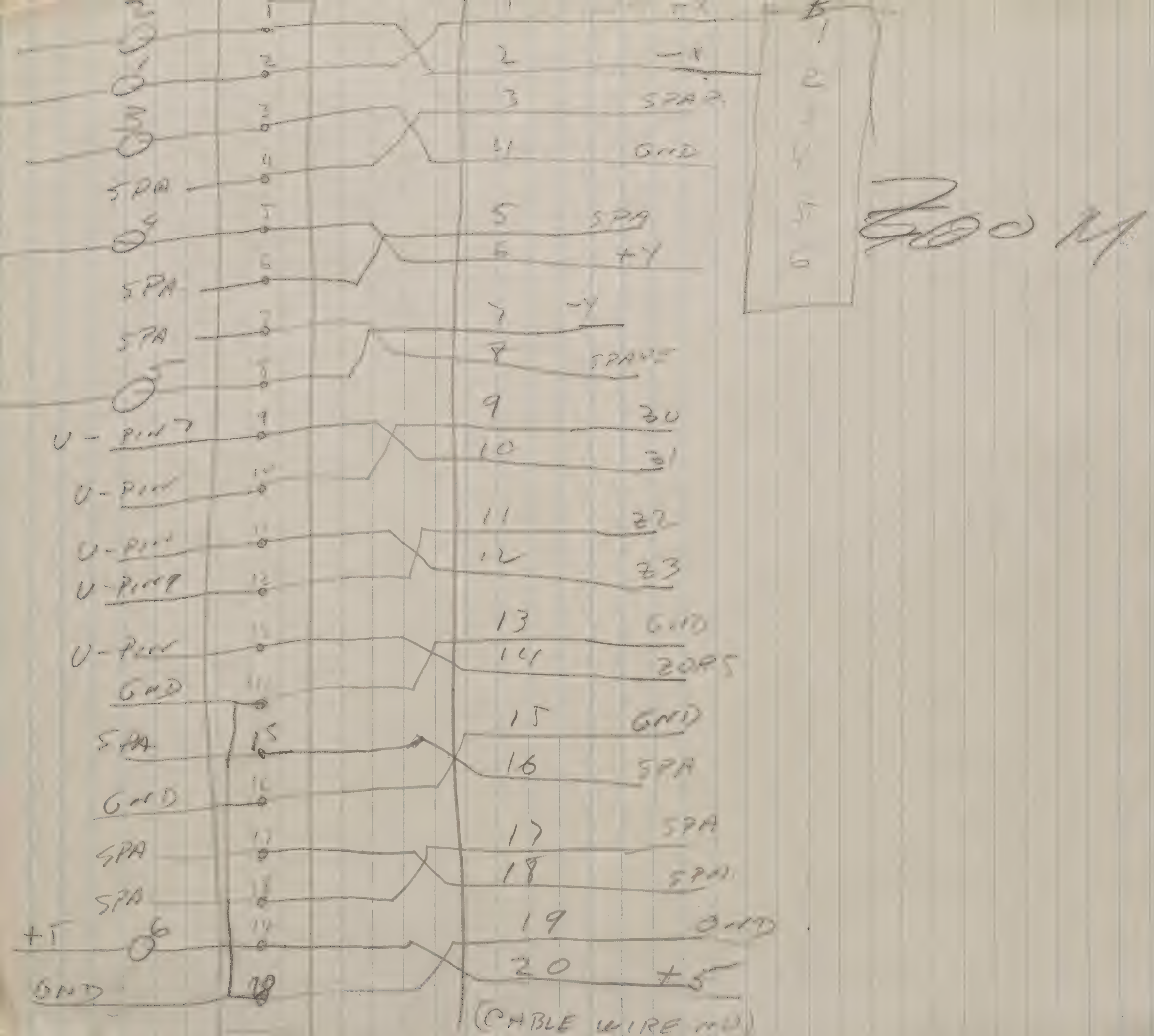
[illegible] − 12

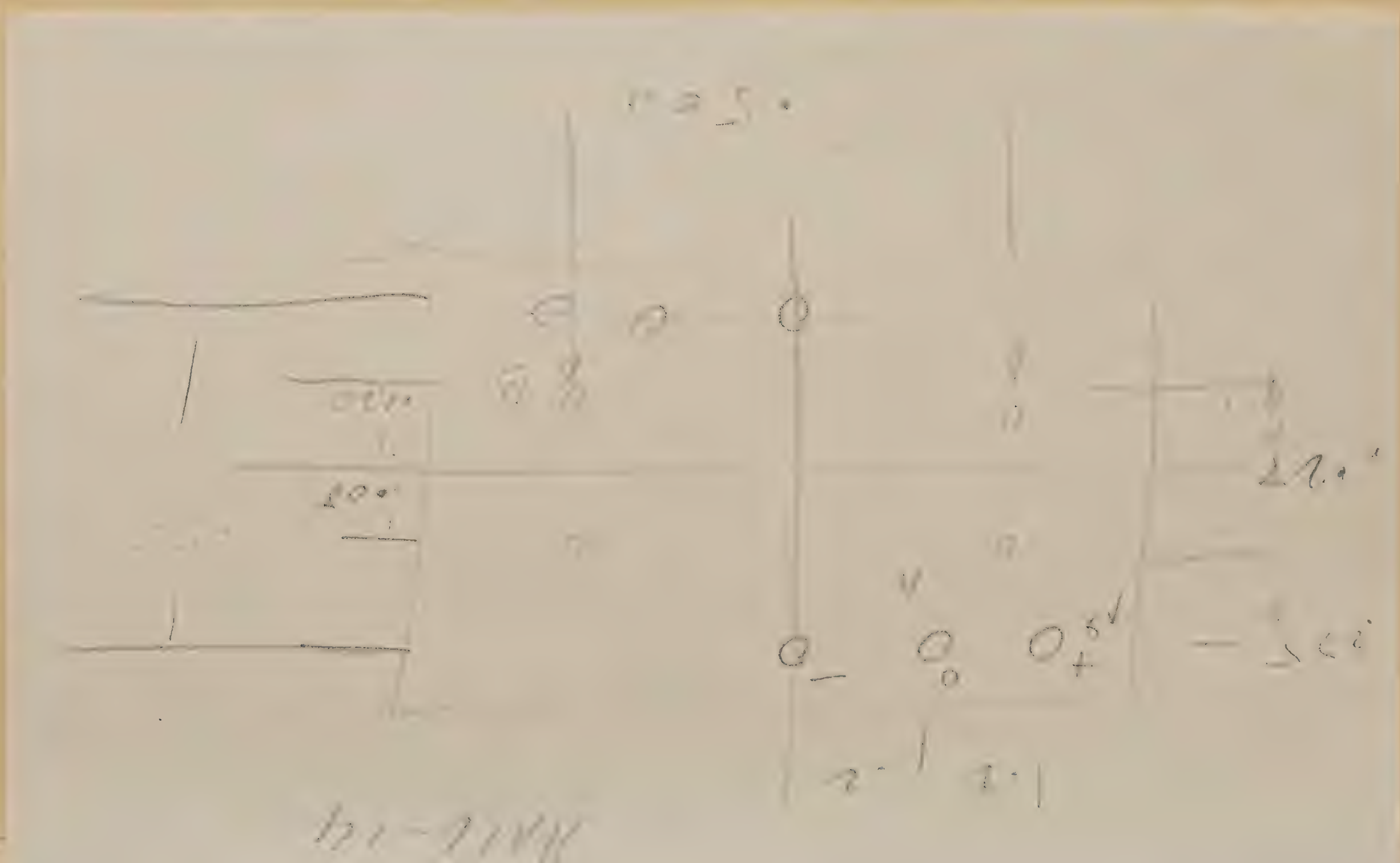
+ 28

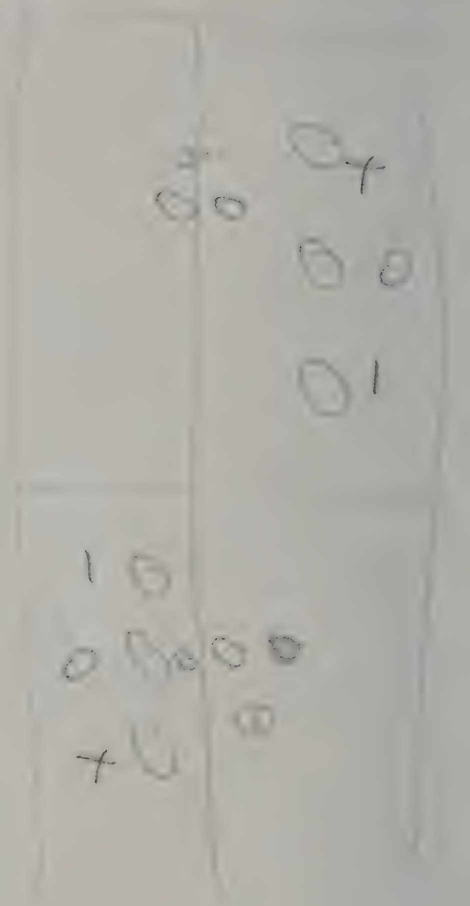
[illegible]

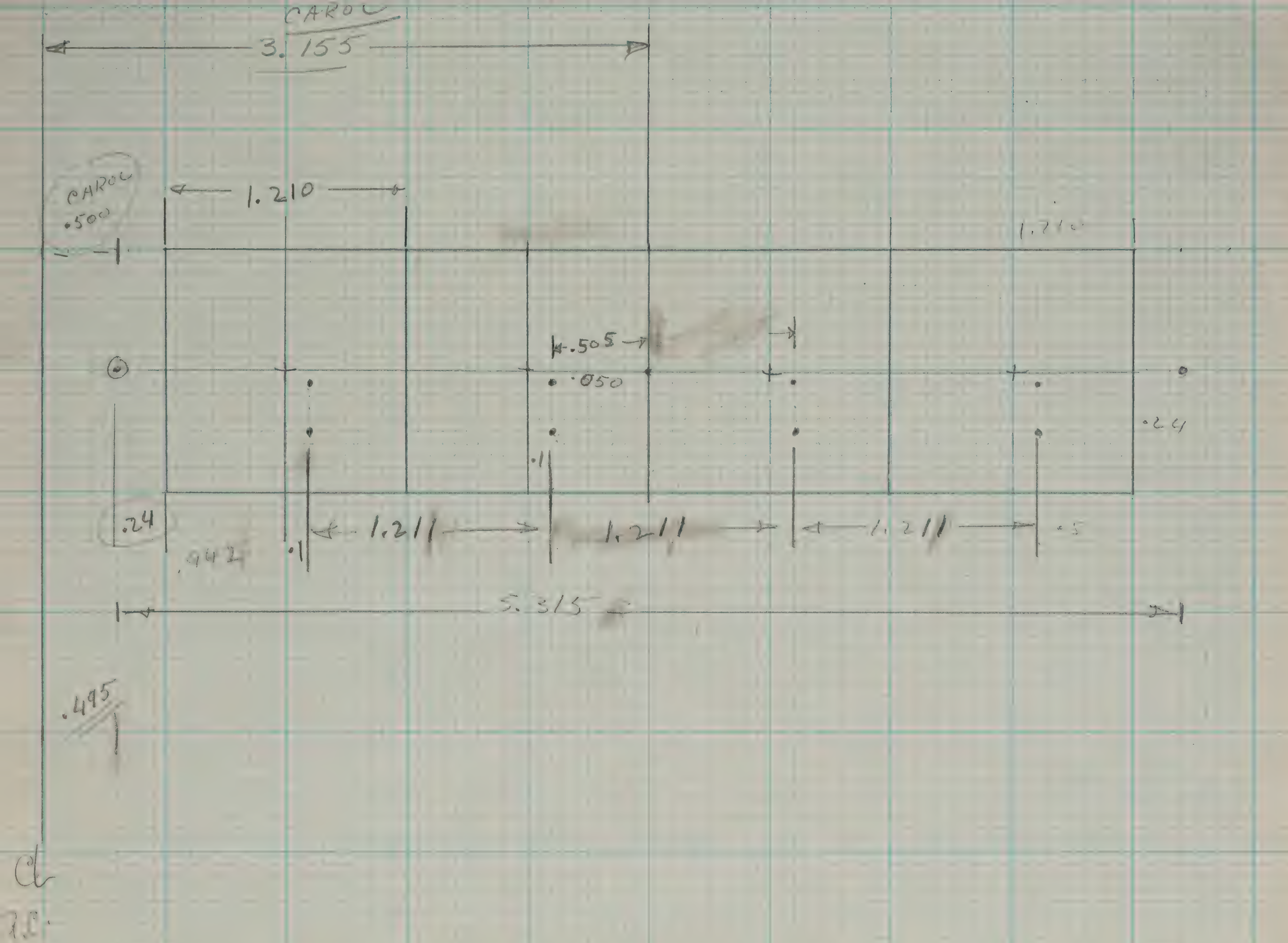
[illegible]

14 920

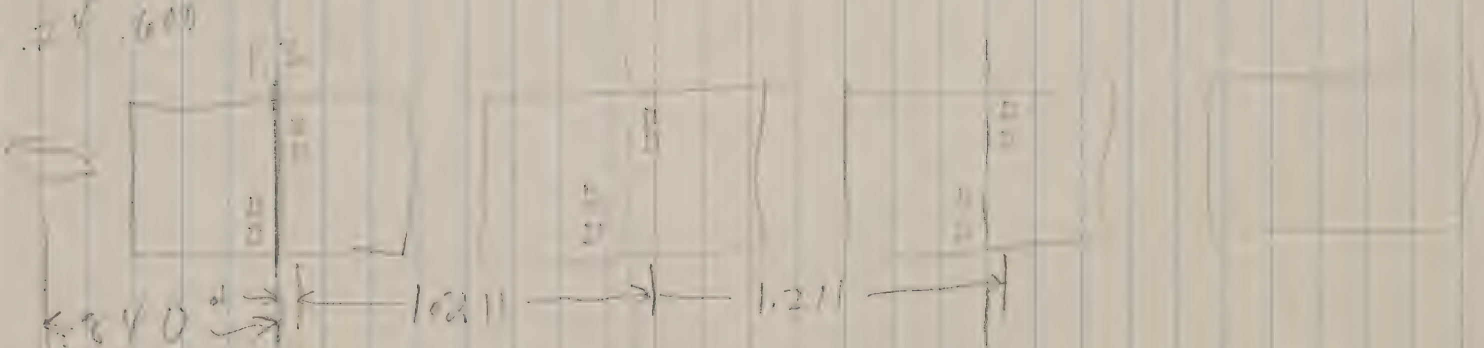

SPA
SPA
SPA
U - PIN 7
U - PIN
U - PIN
U - PIN 8
U - PIN
GND
SPA
GND
SPA
SPA
+5
GND
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
-X
SPAR
GND
SPA
+Y
-Y
SPARE
30
31
32
33
GND
ZORS
GND
SPA
SPA
SPA
GND
+5
(CABLE WIRE NO)
Z80 M

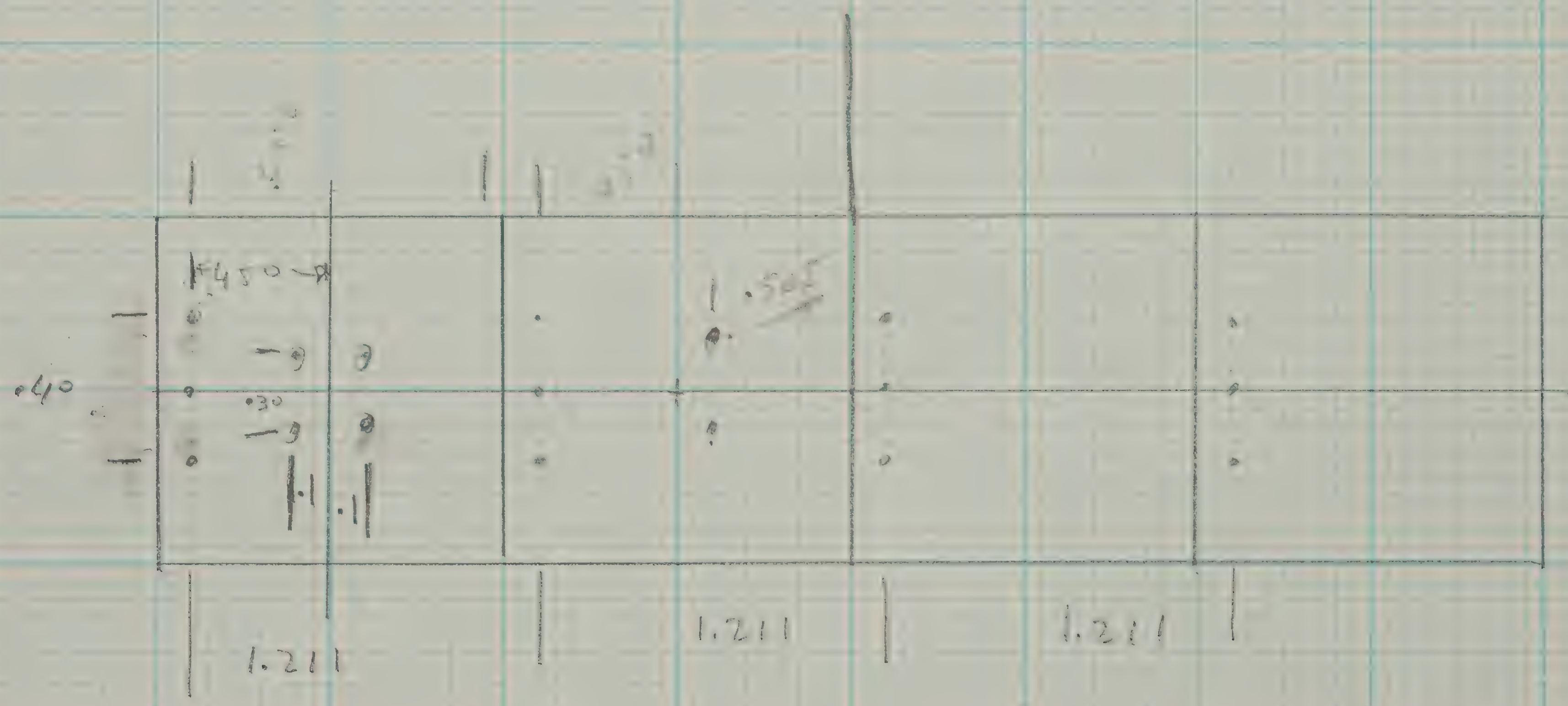






CAROL
3.155
CAROL
.500
1.210
.505
.050
.24
.942
.1
.1
1.211
1.211
1.211
.24
5.315
.495


1.211
1.211

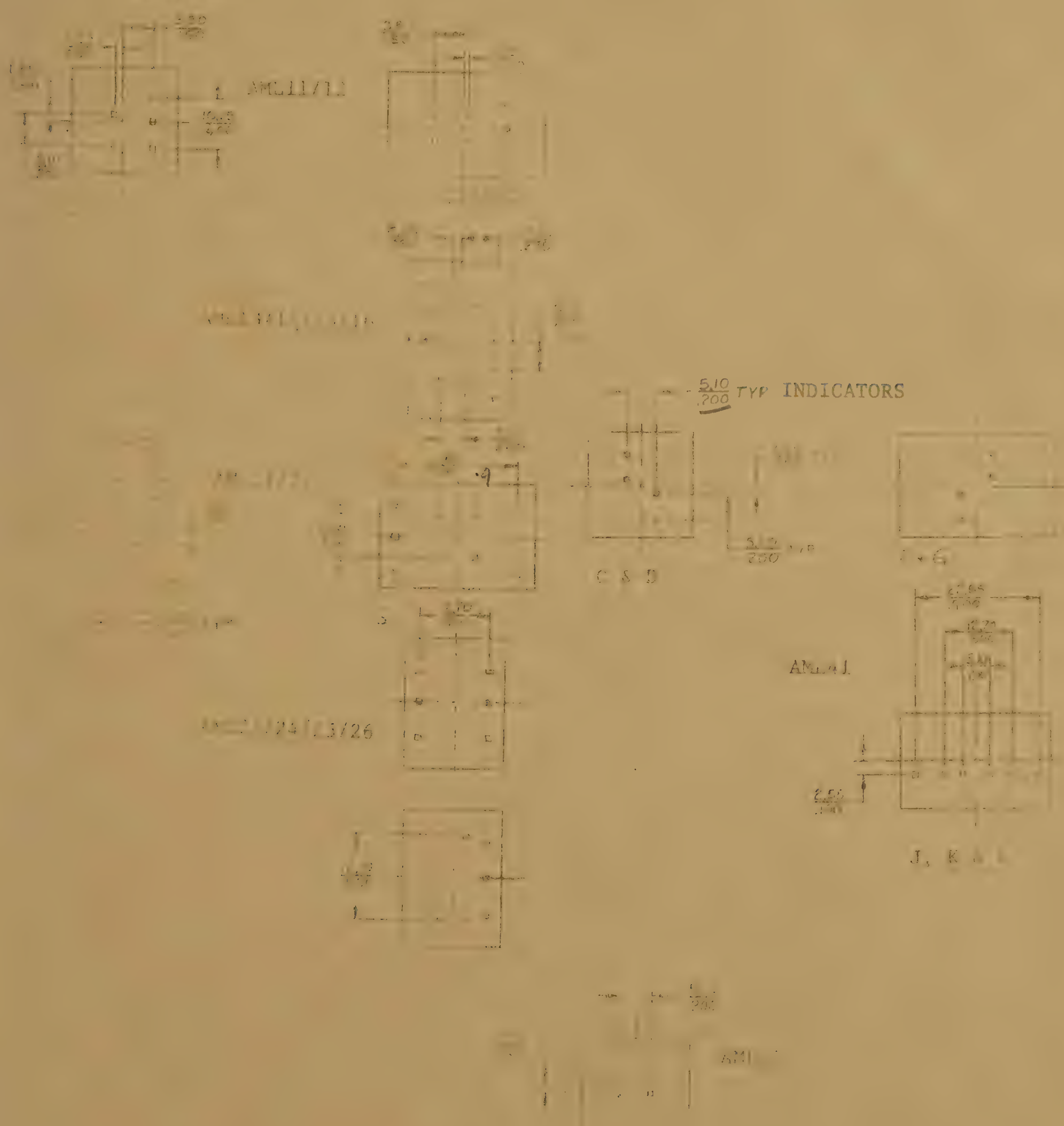

.450
.40
.30
.1
.1
.505
1.211
1.211
1.211

MOUNTING INFORMATION (continued)

Printed Circuit Board Mount

TYPICAL SETS OF TERMINAL LOCATIONS

SWITCHES

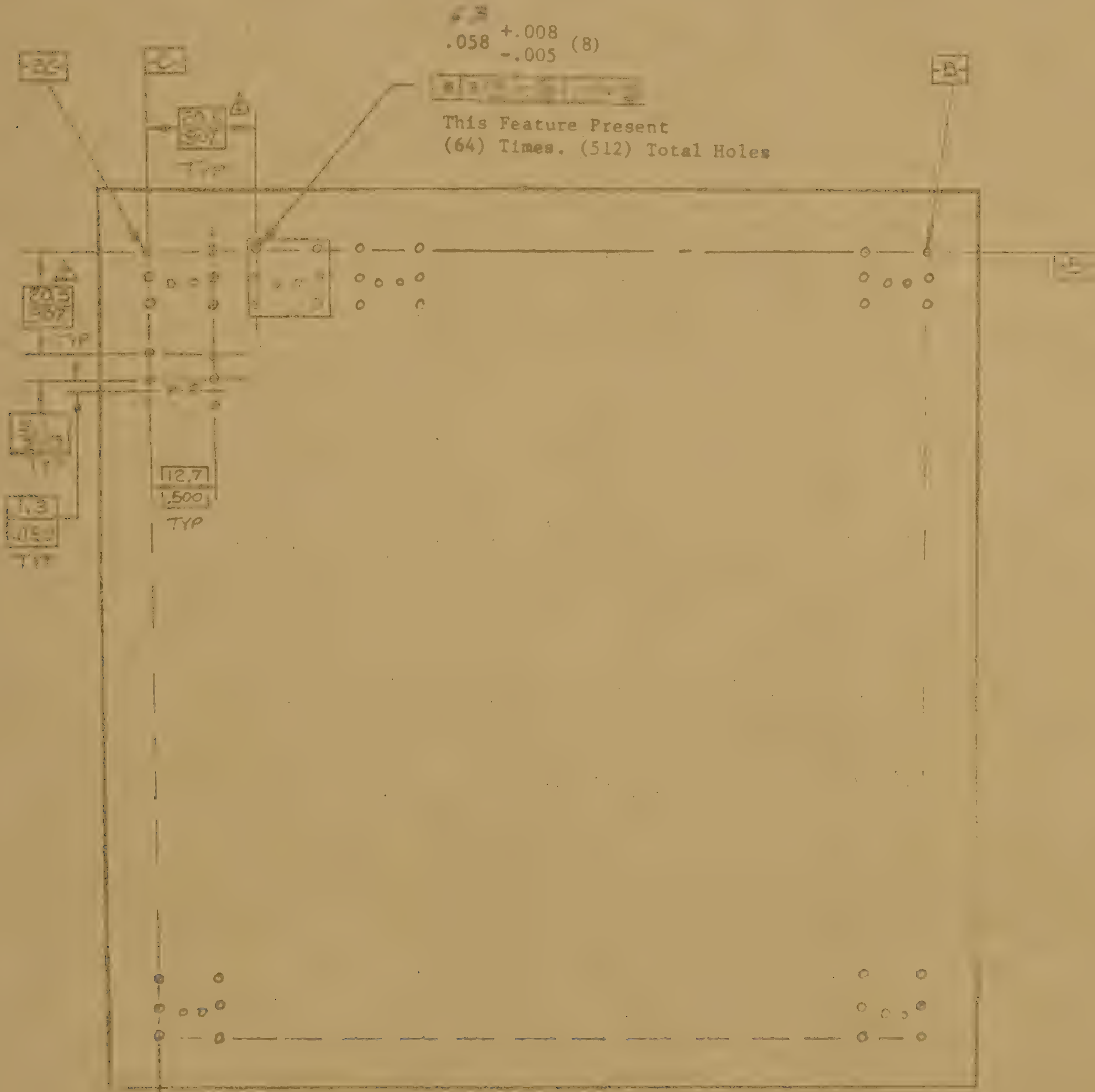


MOUNTING INFORMATION (continued)

Printed Circuit Board Mount

AML21C 8 X 8 UNIT MATRIX

The .058" dia. holes are true positioned with respect to B and C datums.



NOTES:

1. Component Side For Sub Panel Mounting.
2. Rectangular Units: Width Dimension = 20,55/.810 BSC
   Length Dimension = 20,75/1.211 BSC
3. AML 21C Type Unit Is Illustrated.

2.120
050

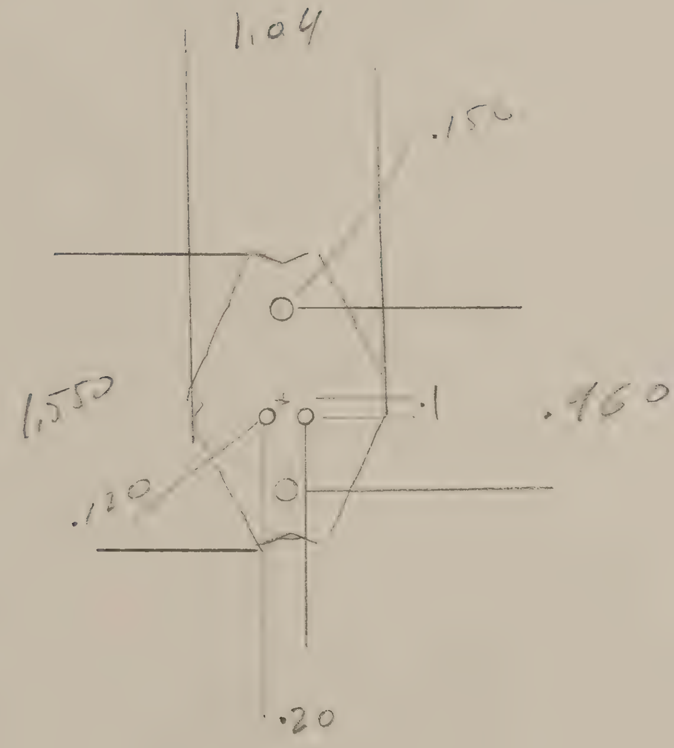
2.070

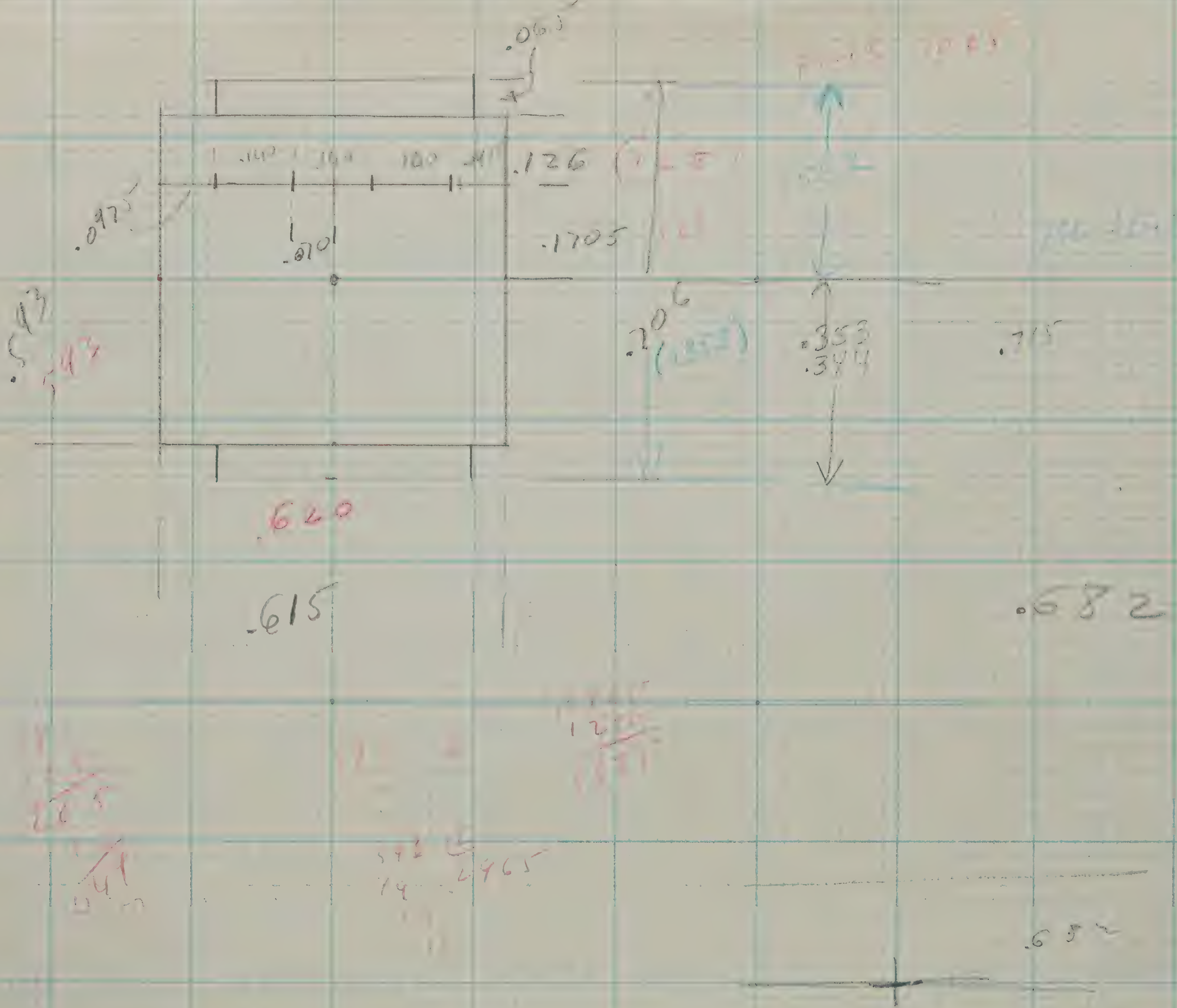
2" X 2"

2.2

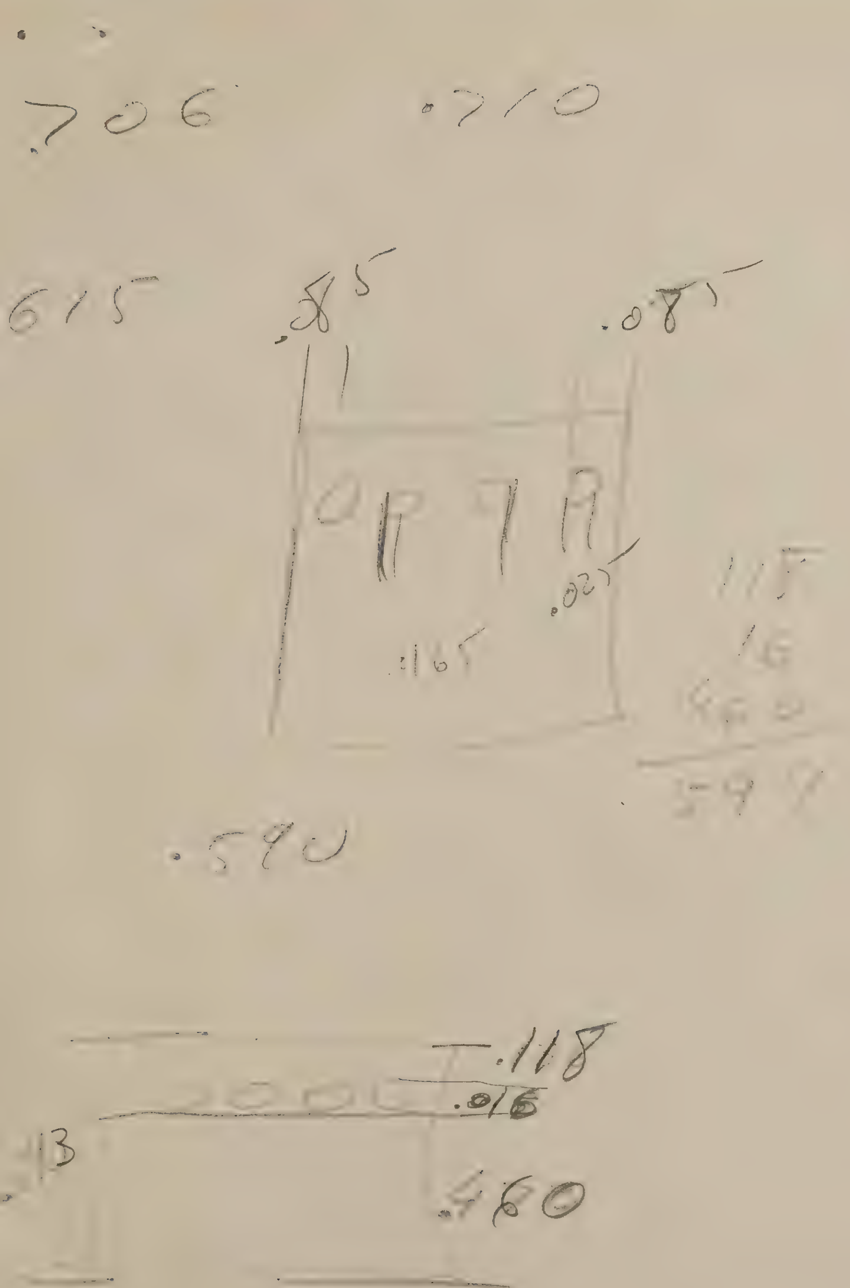
2.14
1

2.24


1.04
.150
1,550
.1
.460
.120
.20


.063
.126
.1705
.0975
.010
.640
.615
.353
.384
.715
.682


.085
.161
.065
.118
.026
.025
.140
.460
.615


.706
.710
.615
.85
.085
.025
.165
115
16
.590
.118
.016
.13
.460

A [illegible] ~~[illegible]~~ 9-17 [illegible]

CORRECTIONS PER [illegible]

8K

Pull down resistors ~~([illegible])~~ on

output pins 15 Thru 21, + 24/U-15 to gnd.

8

---

change U-8 + U-9 To 74LS09

Change U-1 to operate on ⊔ master clear

Add .01 Capacitors

To U-11 + U-12 pins [illegible] to gnd.

[illegible] SWITCH WIRING

S-56 - 3A-8 (was 3A-5)

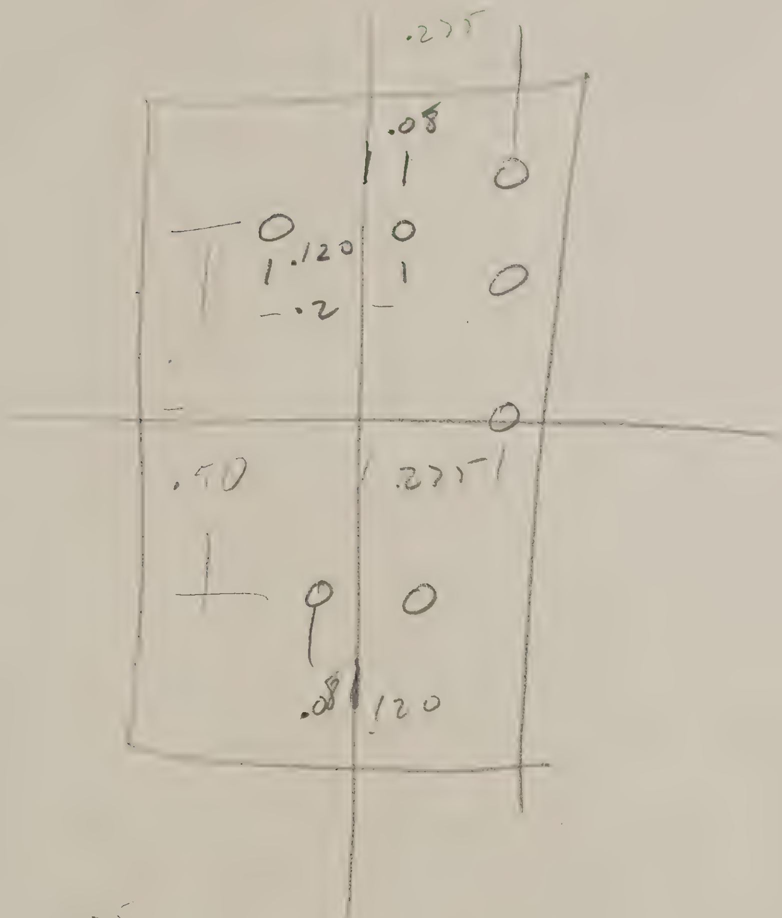
S-65 - 4A-11 (was [illegible])

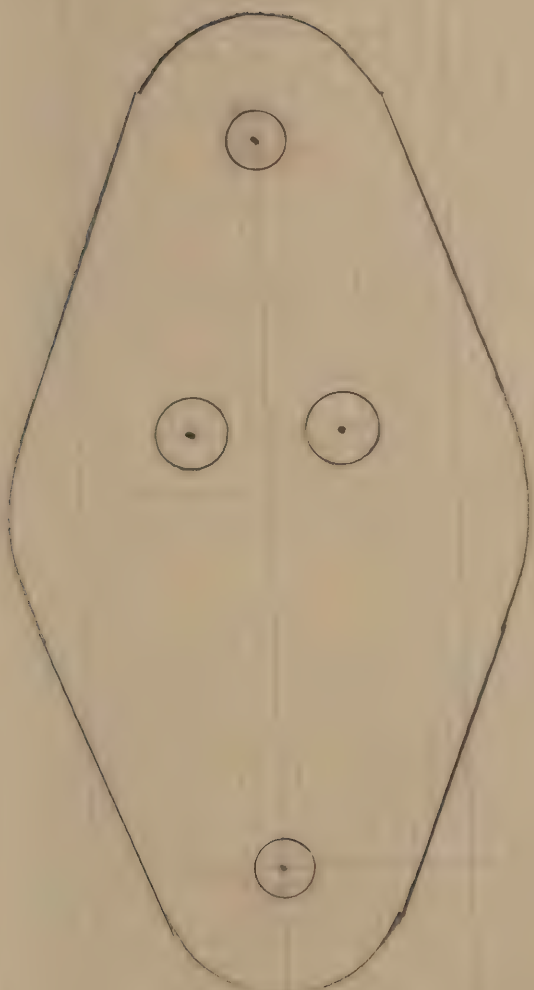
~~5-86~~ A-12 6 3A-9 (was 3A-6) [illegible]

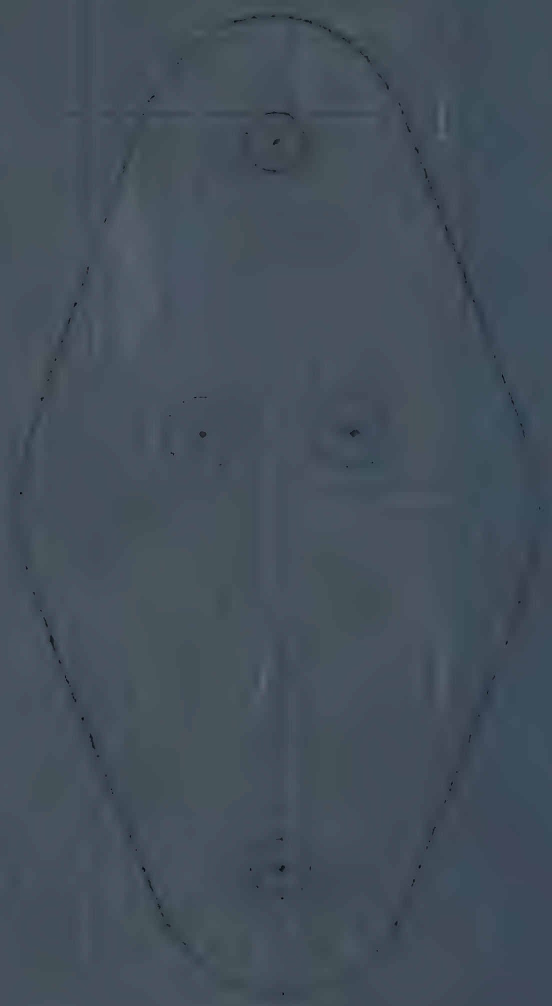
?

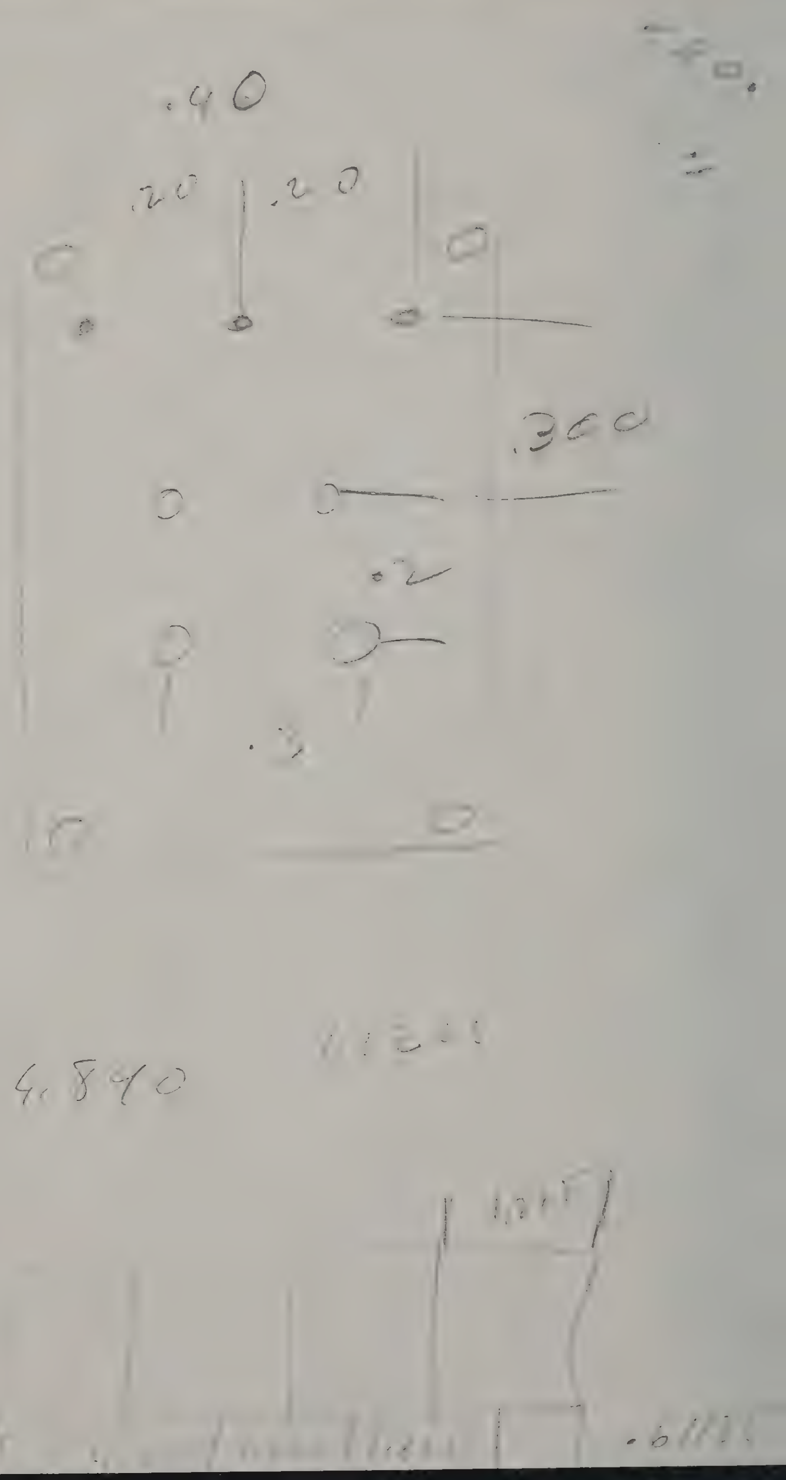
Gnd for S-12, S-25, S-38, S-80

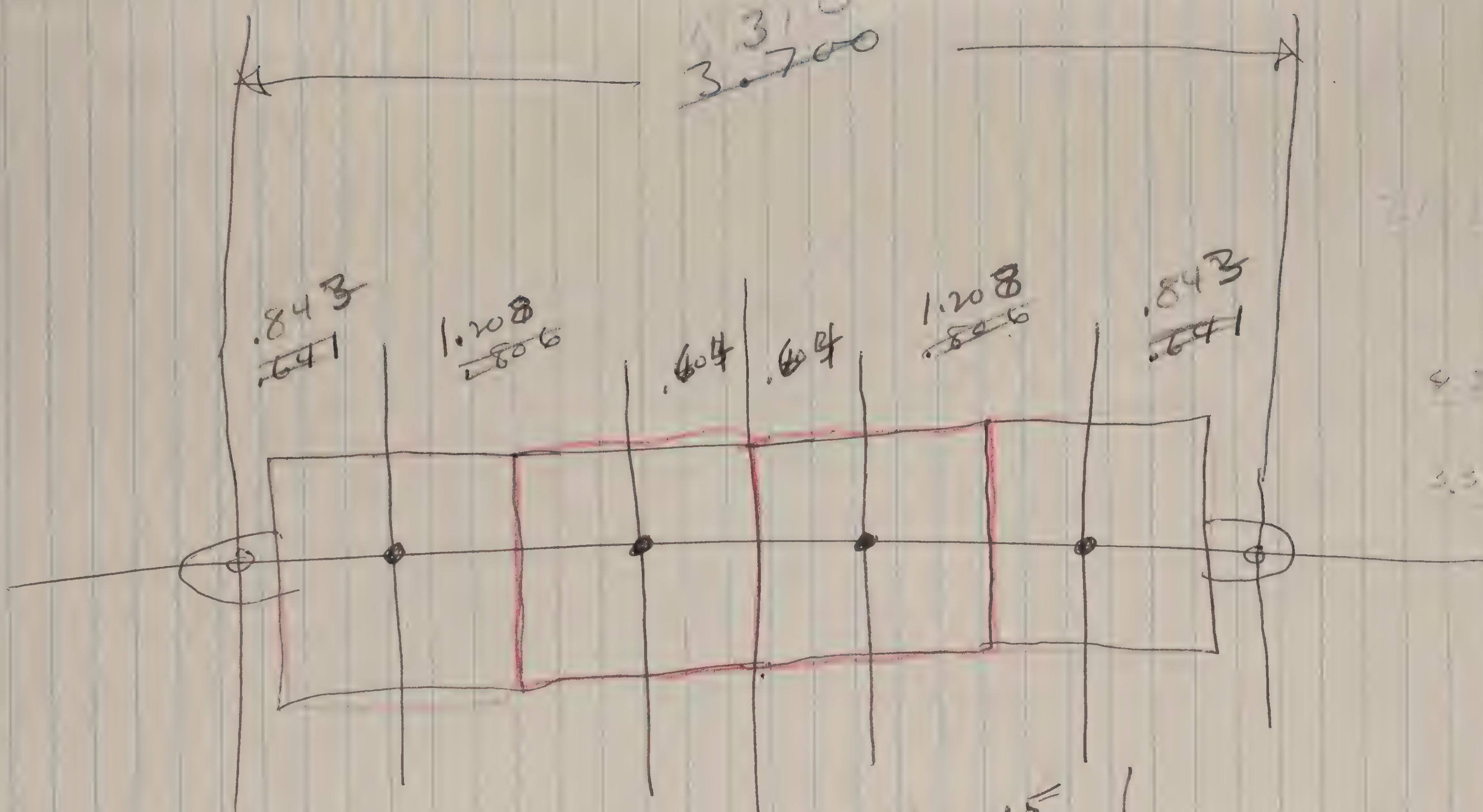
Strobe enable ?


.275
.08
.120
.2
.50
.275
.08
120





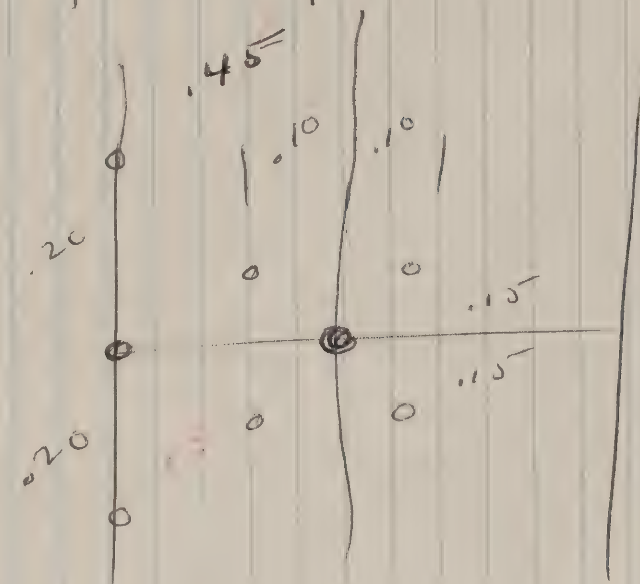

.40
.20
.20
.300
.2
4.840



3.624

$$\frac{1.685}{-1.207} = .478/2 = .239 + .603 = .842$$

$$\frac{\begin{array}{r}12.550\\1.685\end{array}}{10.865/9} = 1.207 / 2 = .603$$



1.41
3.224

25.050

6.310

25.240

18.86

070

TECHNIQUE FOR WAVE SOLDERING SD SWITCH MODULES

1. No attempt should be made to wave solder any SD module into a P.C. board without the support of a rigid panel. See Figure 5 for an example of a panel we recommend. It is constructed of .050'', half-hard steel and is designed especially for the insertion of SD modules.

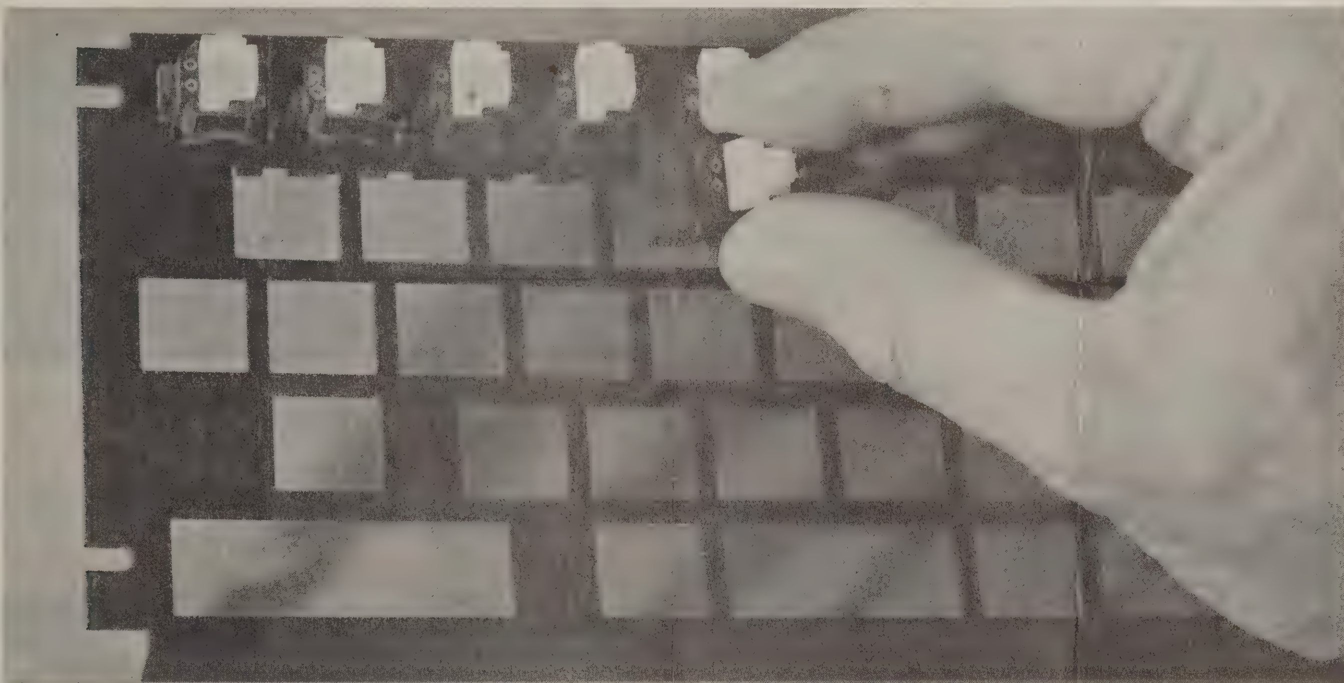


Figure 5
RECOMMENDED MODULE SUPPORT

2. Wave soldering should be accomplished using **only** a mildly activated water white rosin flux. **Do not** use water soluble fluxes.
3. Pre-heat . . . the temperature on the top (component) side of the P.C. board should be 200°F prior to the actual wave soldering operation.
4. The solder temperature of the wave solder pot should be maintained at 500°F.
5. Maintain a **minimum** conveyor speed of 4 feet per minute. Select the conveyor speed that will give full solder fillets and a minimum of solder bridging and icicles.
6. We recommend using Loncotergė 446, manufactured by the London Chemical Company, in the aqueous cleaning system. Loncoterge 446 is a liquid concentrate that is added to water to remove the **flux residue.**
7. The average field-use concentrations of 446 by application are:

   4-8% by volume in water in automatic ''in-line'' spray cleaners. Solution temperature 130-150°F.
   5-10% by volume in water in dip tanks heated to 130-150°F.
   5-10% by volume in water in converted dishwaters.

8. A thorough water rinsing is necessary for complete removal of all contaminates from the printed circuit assemblies. We recommend a spray water rinse at 120 psi pressure.
9. Dry the printed circuit assembly (without buttons) after cleaning in an oven at 160°F for 2 hours min.
10. **CAUTION:** If other cleaning methods are selected that use Fluorocarbons or Trichlorethelene for the removal of flux residue, all precautions should be taken to prevent the liquid from coming in contact with the SD switch modules.

MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

IN CANADA: 740 Ellesmere Road, Scarborough, Ontario.
HONEYWELL INTERNATIONAL: Sales and service offices in all principal cities of the world.

Instruction Sheet

SD SOLID STATE SWITCH MODULE REPLACEMENT AND RECOMMENDED WAVE SOLDERING TECHNIQUE

SWITCH BUTTON REMOVAL

1. Remove the button from the module being replaced and as many adjacent buttons as required to furnish adequate work space. The buttons can be removed by pulling upward or by prying upward, with a padded tool, from their under surface.

   We recommend using our "Keytop Puller." Refer to figure 1. This unique device makes the job of pulling buttons off the keyboard plungers easier. Order as SW-11485.

NOTE

Remove buttons from alternate action modules only when they are in the free position. Failure to do this will result in damage to the module.

Figure 1
BUTTON REMOVAL

SWITCH MODULE REMOVAL

2. Refer to figure 2. Unsolder the four terminals of the lead frame package from the termination board, using a 750°F controlled temperature iron. When unsoldering the terminals, use a solder removal tool to remove all solder from the pin holes in the printed circuit board.

Figure 2
UNSOLDERING TERMINALS

3. Refer to figure 3. Insert module removal tools (Order as SD-10101) at each end of the module.

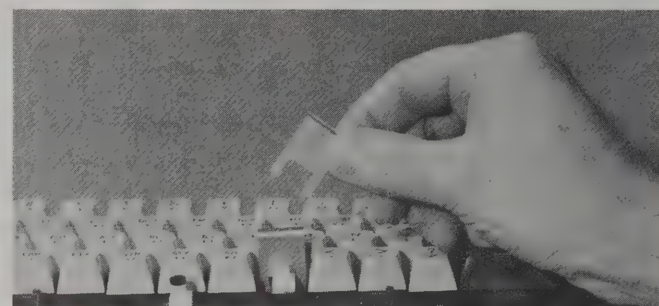


Figure 3
INSERTING REMOVAL TOOLS

4. Refer to figure 4. With the module removal tools in position, grip the switch module with a pair of pliers and pull straight out.

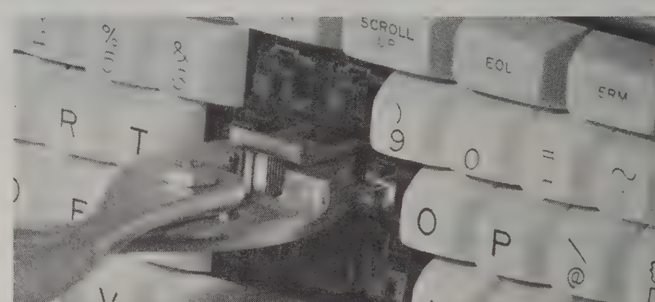


Figure 4
MODULE REMOVAL

SWITCH MODULE INSTALLATION

5. Replace with new module. Take care to orient switch properly and observe that solder terminals are through the printed circuit board prior to snapping in place.

6. Solder the new switch terminals using 60/40 rosin core solder employing a 750°F controlled temperature 1/8" chisel tip soldering iron.

   CAUTION: The solder tip should *never* be held on the terminal for over 4 seconds.

7. The solder connections may be cleaned with a mild solvent. However, take care not to contact the switch with the solvent.

8. Reassemble the buttons on the switch modules. When work has been completed, perform a visual check to see that the correct buttons are returned to the correct modules.

QUAD MODE KEYBOARD ENCODER MASK SPECIFICATION SW-20416 CS 044 33

CODING MATRIX %CARDS 01 - 80"

	SW NO	INPUT PATTERN ABCDEFGHIJKLM	SA TK	MODE 1 9876543210	MODE 2 9876543210	MODE 3 9876543210	MODE 4 9876543210
01	20416	0011111111111	10	0110000000	0110000000	1101000000	0111100000
02	20416	0101111111111	10	1100000001	1100000001	1101100001	0111000001
03	20416	0110111111111	10	1100000010	1100000010	1101100010	0111000010
04	20416	0111011111111	10	0110000011	0110000011	0111100011	1101000011
05	20416	0111101111111	10	1100000100	1100000100	1101100100	0111000100
06	20416	0111110111111	10	0110000101	0110000101	0111100101	1101000101
07	20416	0111111011111	10	0110000110	0110000110	0111100110	1101000110
08	20416	0111111101111	10	1100000111	1100000111	1101100111	0111000111
09	20416	0111111110111	10	1100001000	1100001000	1101101000	0111001000
10	20416	0111111111011	10	0110001001	0110001001	0111101001	1101001001
11	20416	1001111111111	10	0110001010	0110001010	0111101010	1101001010
12	20416	1010111111111	10	1100001011	1100001011	1101101011	0111001011
13	20416	1011011111111	10	0110001100	0110001100	0111101100	1101001100
14	20416	1011101111111	10	1100001101	1100001101	1101101101	0111001101
15	20416	1011110111111	10	1100001110	1100001110	1101101110	0111001110
16	20416	1011111011111	10	0110001111	0110001111	0111101111	1101001111
17	20416	1011111101111	10	1100010000	1100010000	1101110000	0111010000
18	20416	1011111110111	10	0110010001	0110010001	0111110001	1101010001
19	20416	1011111111011	10	0110010010	0110010010	0111110010	1101010010
20	20416	1100111111111	10	1100010011	1100010011	1101110011	0111010011
21	20416	1101011111111	10	0110010100	0110010100	0111110100	1101010100
22	20416	1101101111111	10	1100010101	1100010101	1101110101	0111010101
23	20416	1101110111111	10	1100010110	1100010110	1101110110	0111010110
24	20416	1101111011111	10	0110010111	0110010111	0111110111	1101010111
25	20416	1101111101111	10	0110011000	0110011000	0111111000	1101011000
26	20416	1101111110111	10	1100011001	1100011001	1101111001	0111011001
27	20416	1101111111011	10	1100011010	1100011010	1101111010	0111011010
28	20416	1110011111111	10	0110011011	0110011011	1101011011	0111111011
29	20416	1110101111111	10	1100011100	1100011100	0111011100	1101111100
30	20416	1110110111111	10	0110011101	0110011101	1101011101	0111111101
31	20416	1110111011111	10	0110011110	0110011110	1101011110	0111111110
32	20416	1110111101111	10	1100011111	1100011111	0111011111	0111011111
33	20416	1110111110111	10	1000110001	0110100001	1100110001	0110100001
34	20416	1110111111011	10	1000110010	1101000000	1100110010	0110100010
35	20416	1111001111111	10	0010110011	1100100011	0110110011	1100100011
36	20416	1111010111111	10	1000110100	0110100100	1100110100	0110100100
37	20416	1111011011111	10	0010110101	1100100101	0110110101	1100100101
38	20416	1111011101111	10	0010110110	1101111100	0110110110	1100100110
39	20416	1111011110111	10	1000110111	1100100110	1100110111	0110100111
40	20416	1111011111011	10	1000111000	1100101010	1100111000	0110101000
41	20416	1111100111111	10	0010111001	0110101000	0110111001	1100101001
42	20416	1111101011111	10	0010110000	1100101001	0110110000	0010110000
43	20416	1111101101111	10	0010101101	0111011111	0110101101	1100111101
44	20416	1111101110111	10	1000111011	0110111010	1100111011	0110101011
45	20416	1111101111011	10	0010100111	0110100010	0110111010	1100101010
46	20416	1111110011111	10	1000101100	0110111100	1100101100	0110111100
47	20416	1111110101111	10	0010101110	1100111110	0110101110	1100111110
48	20416	1111110110111	10	1000101111	0110111111	1100101111	0110111111
49	20416	1111110111011	10	1100100000	1100100000	1100100000	1100100000
50	20416	1111111001111	10	0011101001	1101001001	0110001001	0110001001
51	20416	1111111010111	10	1001101000	0111001000	1100001000	1100001000
52	20416	1111111011011	10	1001101101	0111001101	1100001101	1100001101
53	20416	1111111100111	10	1000111101	0110101011	0110000000	0110000000
54	20416	1111111101011	10	1001111111	1101111111	1101111111	1101111111
55	20416	1111111110011	10	0011101010	1101001010	0110001010	0110001010
56	20416	0111111111101	10	1001011011	1101011101	0110011011	0110011011
57	20416	1011111111101	10	1001100001	0111000001	1100000001	1100000001
58	20416	1101111111101	10	1001101011	0111001011	1100001011	1100001011
59	20416	1110111111101	10	0011101100	1101001100	0110001100	0110001100
60	20416	1111011111101	10	0011110001	1101010001	0110010001	0110010001
61	20416	1111101111101	10	0011110010	1101010010	0110010010	0110010010
62	20416	1111110111101	10	1001110011	0111010011	1100010011	1100010011
63	20416	1111111011101	10	0011110100	1101010100	0110010100	0110010100
64	20416	1111111101101	10	0011100101	1101000101	0110000101	0110000101
65	20416	1111111110101	10	1001100100	0111000100	1100000100	1100000100
66	20416	1111111111001	10	0011110111	1101010111	0110010111	0110010111
67	20416	0111111111110	10	0011111000	1101011000	0110011000	0110011000
68	20416	1011111111110	10	1001111001	0111011001	1100011001	1100011001
69	20416	1101111111110	10	1001111010	0111011010	1100011010	1100011010
70	20416	1110111111110	10	1001100010	0111000010	1100000010	1100000010
71	20416	1111011111110	10	0011100011	1101000011	0110000011	0110000011
72	20416	1111101111110	10	0011100110	1101000110	0110000110	0110000110
73	20416	1111110111110	10	1001100111	0111000111	1100000111	1100000111
74	20416	1111111011110	10	1001101110	0111001110	1100001110	1100001110
75	20416	1111111101110	10	0011101111	1101001111	0110001111	0110001111
76	20416	1111111110110	10	1001110000	0111010000	1100010000	1100010000
77	20416	1111111111010	10	1001110101	0111010101	1100010101	1100010101
78	20416	1111111111100	10	1001110110	0111010110	1100010110	1100010110
79	20416	0000000000011	00	1111111111	0000000000	1111111111	0000000000
80	20416	2223223222222	00	0000000000	0000000000	0000000000	0000000000

CARD SH- SHIFT COMBINATIONS

	SW-NO	S MODE 1231234	S MODE 1231234	S MODE 1231234	S MODE 1231234	S MODE 1231234	S MODE 1231234	S MODE 1231234	S MODE 1231234
SH	20416	0000010	0011000	0101000	0110000	1000001	1010100	1101000	1110000

CARD MO- MISCELLANEOUS MASK OPTIONS

	SW-NO	INPUT RESISTORS ABCDEFGHIJKLM S123	INT SE	FF USED 9876543210	OUT ENBL CTL SA9876543210
MO	20416	PPPPPPPPPPPPP MMM	N	YNYYYYYYYY	YYYYYYYYYYYY

MOS KEYBOARD ENCODER BONDING SPECIFICATION %MASK FRST USE IN SW-20416"
CARDS B1 AND B2- PACKAGE DEFINITION %28 OR 40 FOLLOWED BY PIN ASIGNMT"

	SW-NO	PK	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
B1	20416	28	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	S1	S2	B0	B1	B2	B3	B4	B5

	SW-NO	PK	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
B2	20416	28	B6	B7	B8	ST	AE	VS	V0	VG												

PIN ASSIGNMENTS AND OPTION NOTES SW-20416 C

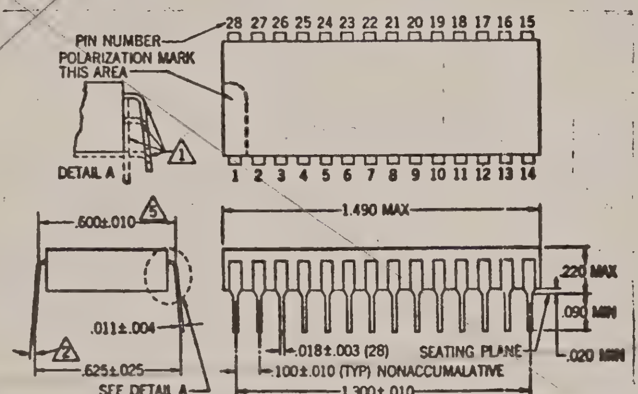
CHIP FUNCTION	CHIP PAD NAME	PIN NO.	NOTES
KEY INPUT A	IA	1	INPUT RESISTOR CONNECTED TO +5 VOLTS
B	IB	2	INPUT RESISTOR CONNECTED TO +5 VOLTS
C	IC	3	INPUT RESISTOR CONNECTED TO +5 VOLTS
D	ID	4	INPUT RESISTOR CONNECTED TO +5 VOLTS
E	IE	5	INPUT RESISTOR CONNECTED TO +5 VOLTS
F	IF	6	INPUT RESISTOR CONNECTED TO +5 VOLTS
G	IG	7	INPUT RESISTOR CONNECTED TO +5 VOLTS
H	IH	8	INPUT RESISTOR CONNECTED TO +5 VOLTS
I	II	9	INPUT RESISTOR CONNECTED TO +5 VOLTS
J	IJ	10	INPUT RESISTOR CONNECTED TO +5 VOLTS
K	IK	11	INPUT RESISTOR CONNECTED TO +5 VOLTS
L	IL	12	INPUT RESISTOR CONNECTED TO +5 VOLTS
M	IM	0	INPUT RESISTOR CONNECTED TO +5 VOLTS
SHIFT INPUT1	S1	13	INPUT RESISTOR CONNECTED TO GROUND
2	S2	14	INPUT RESISTOR CONNECTED TO GROUND
3	S3	0	INPUT RESISTOR CONNECTED TO GROUND
DATA OUTPUT 0	B0	15	LATCH USED / OUT GATE USED
1	B1	16	LATCH USED / OUT GATE USED
2	B2	17	LATCH USED / OUT GATE USED
3	B3	18	LATCH USED / OUT GATE USED
4	B4	19	LATCH USED / OUT GATE USED
5	B5	20	LATCH USED / OUT GATE USED
6	B6	21	LATCH USED / OUT GATE USED
7	B7	22	LATCH USED / OUT GATE USED
8	B8	23	LATCH BYPASSED / OUT GATE USED
9	B9	0	LATCH USED / OUT GATE USED
NO KEY D. OUTPUT	AK	0	/ OUT GATE USED
STROBE OUTPUT	ST	24	INT STEA NOT USED / OUT GATE USED
OUTPUT ENABLE IN	OE	0	
STE-A	AE	25	STROBE ENABLE (DC)
STE-B	BE	0	STROBE ENABLE (ONE-SHOT)
+5 VOLT SUPPLY	VS	26	4.5 TO 6.5 VOLTS
GROUND	V0	27	
-12 VOLT SUPPLY	VG	28	20% MOS BIAS

NOTE--- 0 FOR PIN NO. MEANS NO CONNECTION

SHIFT DEFINITION SW-20416

S1	S2	S3	MODE
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	4
1	0	1	2
1	1	0	1
1	1	1	0

NOTES:
1. Leads may egress from top, side or bottom of package
2. Angle may be 0° to 15°
3. Spacing between exposed conductors shall be .015 min
4. Conductive, accessible, areas on top of package shall be electrically isolated from pins
5. Dimension between center line of leads when formed parallel



IC MOS QUAD PLASTIC	SW-20416-K
IC MOS QUAD CERAMIC	SW-20416

A	DWG REV	34726	RV	DJJ
A	SW-20416-K ADDED	DR1385	RV	DJJ

THIRD ANGLE PROJECTION

TITLE INTEGRATED CIRCUIT—MOS (QUAD MODE)

RELEASE NO. PR-2990

MATERIAL PERFORMANCE REQUIREMENTS PER CS 044 33

DRAWN RV 23DEC74

MICRO SWITCH
FREEPORT ILLINOIS U S A
A DIVISION OF HONEYWELL

SCALE NONE

ISSUE 2

DRAWING NUMBER SW-20416 ★

MICRO SWITCH

DATA SHEET

DUAL MODE STATIC MOS ENCODER

GENERAL DESCRIPTION

This data sheet contains information to help you understand Static Encoding for MICRO SWITCH Solid State Keyboards. With this information all that is necessary is to define the two input pins for each keystation (to agree with your PC board layout) and the individual code for each key. Refer to figure 4 for the Pin Layout.

MICRO SWITCH Static MOS Encoder is a programmable, dual mode device consisting of an MOS integrated circuit in a dual-in-line package. The package consists of:

1. An input decoder (addressed from the two isolated outputs from each key switch).
2. An output encoder (addressed by the input decoder and a mode selection input).
3. A control logic section.
4. An output buffer (driver) compatible with bipolar logic levels.

Figure 1 illustrates the Block Diagram for the MOS circuit.

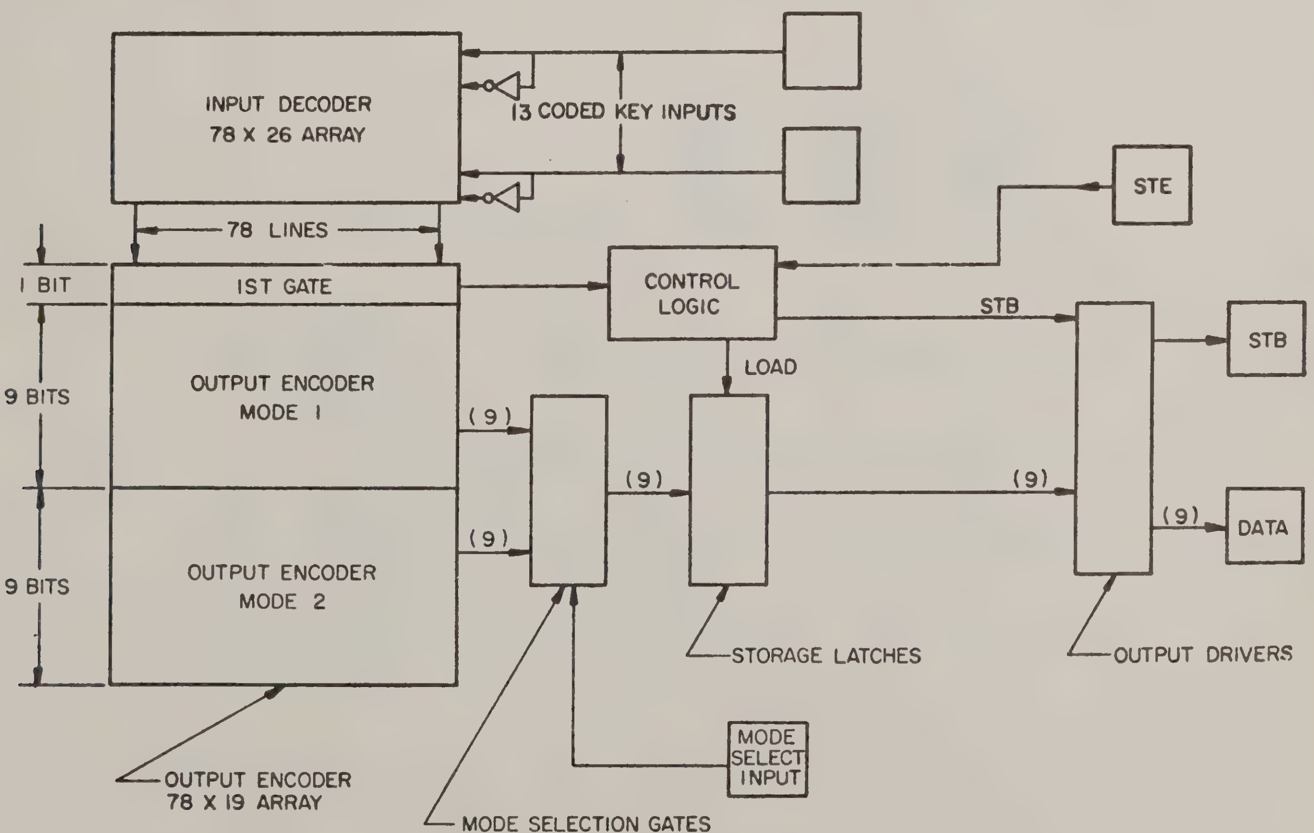


FIGURE 1 - BLOCK DIAGRAM

MICRO SWITCH's Dual Mode Static MOS circuit is capable of accepting input from up to 78 data keys and can generate two nonrelated codes of nine bits each per encoded key. The determination of which of these two codes is to be presented to the output is controlled by the shift keys and in some cases, by a system shift input.

Static MOS encoding can generate any code specified. Totally unrelated codes can be generated by the same keys. For instance, a keyboard can be specified that generates two modes of USASCII or two modes of EBCDIC. Since we do not have to logically pair our encoding for multi-mode operation, you can pair characters in any way you choose.

INPUT DECODER

Inside the MOS package the first stage of logic is the decode matrix. The function of decoding is to convert the 2 out of 13 inputs to 78 separate lines. Each of these lines identifies a specific encoded key.

The input decoder consists of an array of gates addressed by 13 inputs derived from keys on the keyboard. The 13 inputs are first inverted, then the 13 original and 13 inverse signals are used to drive the array. The array consists of 78 AND gates, each of which may be programmed to identify any specified input pattern of 13 bits. The programmed pattern will usually consist of a 2 of n combinatorial code in either positive or negative logic. The 78 outputs of the AND gates are used to drive the output encoder.

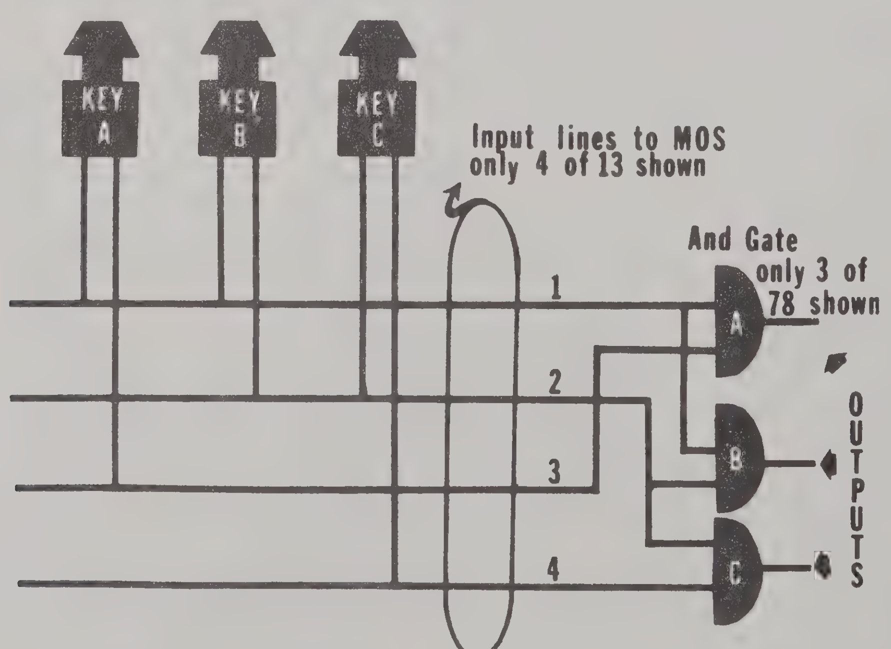


Figure 2

Figure 2 illustrates that if key "A" were operated, input lines 1 and 3 would be on, and gate "A" would produce an output. Likewise, if key "B" were operated, gate "B" would be on. If both keys were operated, both gates would be on, which is undesirable, as the output encoder which follows would attempt to generate both codes and the results would be an erroneous code. In order to eliminate this problem, special decoding circuitry is used as illustrated in figure 3.

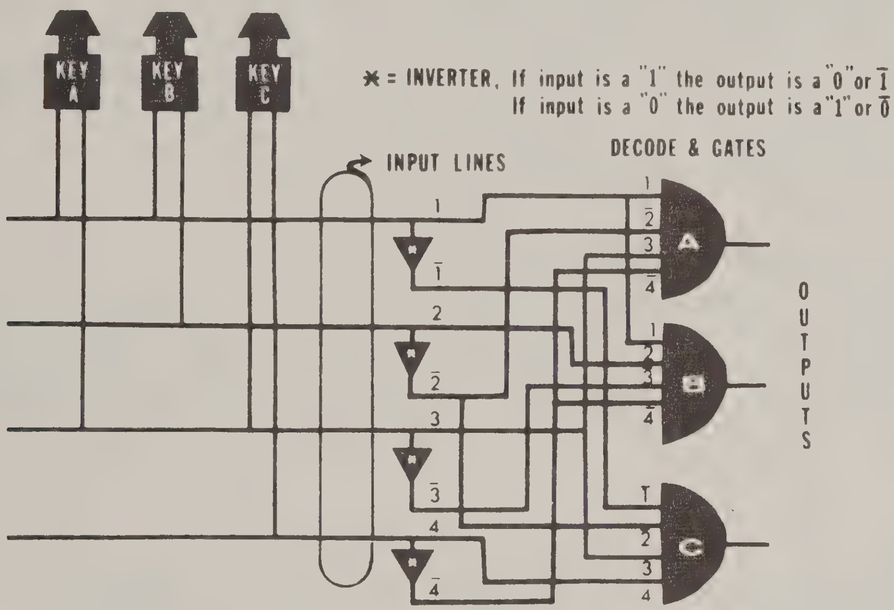


Figure 3

Two-Key Rollover

Within the input decoder section there is two-key rollover logic that compares all 13 inputs, detecting that two and only two are on. The two inputs represent one key down. If more than one key is down there would be more than two inputs present. If the condition of more than two inputs is present the logic prevents change in data and blocks strobe.

The circuit in Figure 3 has been oversimplfied, in reality, there are not 4 inputs but 13, and there are also 13 inverters.

Two-Key rollover logic is included in all our Static MOS encoded keyboards regardless of the fact that "n" key rollover may be the primary electrical interlock. Since there is a remote possibility of having the pulsed outputs from two keys on a "n" key rollover keyboard appear on the address lines at the same time, the two-key rollover network prevents strobe generation and appearance of garbled data.

Two-key-rollover insures the encoded bits and strobe are not generated when 2 or more keys are actuated. The sequence is as follows:

a. 1st key depressed. Encoded output and strobe generated.
b. 2nd key depressed. Encoded output from first key is held in the flip-flops and strobe is blocked.
c. 1st key released, 2nd key still depressed. Encoded output from 2nd key and strobe are generated once and the first key is released.

OUTPUT ENCODER

The output encoder is an array of 19 OR gates, each having 78 inputs corresponding to the 78 outputs from the input decoder (refer to figure 1). Each input of each gate is programmable so that each gate may perform the OR function or any subset of the 78 decoder outputs.

One of the 19 gates will usually be programmed to be driven by all of the 78 decoder outputs to generate an internal timing reference. The remaining 18 gates are arranged in two groups (modes) of 9, with one of the two groups selected by a mode select input. These will be programmed to generate the output codes assigned to each device input address pattern. Since the 9 bits for each mode are coded directly rather than being derived from the lower case code by logic, we are not concerned whether the code has logic or nonlogical bit paired shifts.

OUTPUT BUFFER AND MODE SELECTION

The two modes of 9 code outputs from the output encoder are used to drive one of two inputs of 18 AND gates (refer to figure 1). The other inputs are driven by two lines, each connected to 9 gates, derived from the original and inverted mode select input. The 9 pairs of gate outputs drive 9, 2-input OR gates, whose outputs drive a set of storage latches. The outputs of the latches are used to drive the output stages.

Output Flip-Flops

The outputs of the mode selection gates, (refer to figure 1) are connected to 9 flip-flops, called "one character storage." Data is held in the flip-flops until the next data key is depressed. Flip-flops were incorporated because in some applications it is not possible for the system to read the keyboard data bits the instant the strobe appears at the output.

The design of the decode, strobe, and flip-flop circuits is such that the data of the first key in a two-key down condition is held in the flip-flop until the first key is released. At that time, a new strobe is generated which sets the second key data into the flip-flops. It will stay there until the second key is released and the next key is operated.

Strobe Enable

An optional input to the MOS chip is a STROBE ENABLE (STE) input (refer to figure 1). This option allows control of the flip-flops from an external source to the keyboard. An example is a system requirement for the keyboard data bits to remain in storage until an "acknowledge" signal is received from the system. This option also allows control of the strobe signal from a source external to the keyboard. As an example, this input could be used in conjunction with an external repeat circuit.

INPUTS

1. Inputs from coded keys and shift input: These 14 inputs shall be provided with resistors that are connected between inputs and Vcc. Resistor values are 2.5 K ohm min., 7.5 K ohm max.

2. Strobe Enable Input: This input shall be provided with a resistor connected to Vcc. Value as in 1.

3. Input Levels: These apply to all inputs as follows:

Logic "1": (Vcc - 1.5) Volts Minimum

Logic "0": (Vdd + 0.8) Volts Maximum

OUTPUTS

1. The ten outputs of the device (nine data and one strobe) shall be capable of providing the following logic levels:

Logic "0": 10 microamperes Maximum (leakage from Vcc)

Logic "1": 2.6 volts Minimum (referred to VDD = OV) at 10.0 milliamperes (current source from Vcc)

POWER SUPPLY

1. The device shall operate with the following power supply requirements. All voltage referred to bipolar ground, to be equivalent to Vdd.

Vss = Vcc: 4.5 to 6.5V at 50 mA max. with no external load connected
Vdd = Ground: OV
Vgg = MOS load gate bias: -12V $\pm$20% at 5 mA. max.

PACKAGE AND ENVIRONMENTAL

1. For pin layout and mounting dimensions, refer to figure 4:

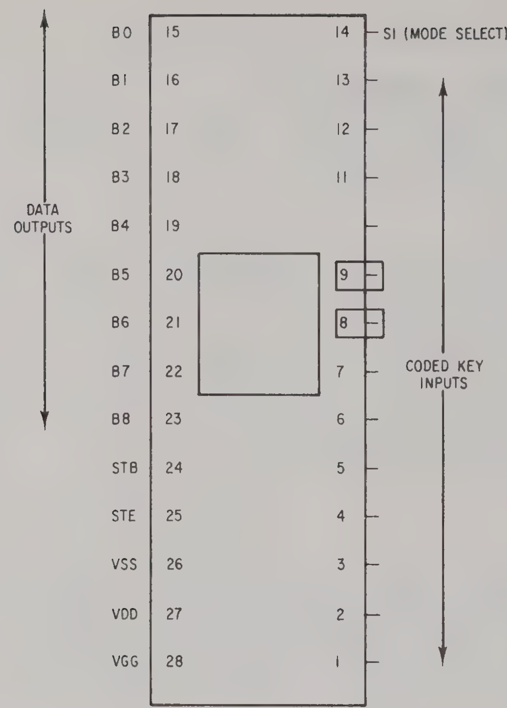
   The package shall be ceramic or plastic dual in line with leads on .100" center and .600" between rows. The package shall have 28 pins arranged as shown in Figure 4.

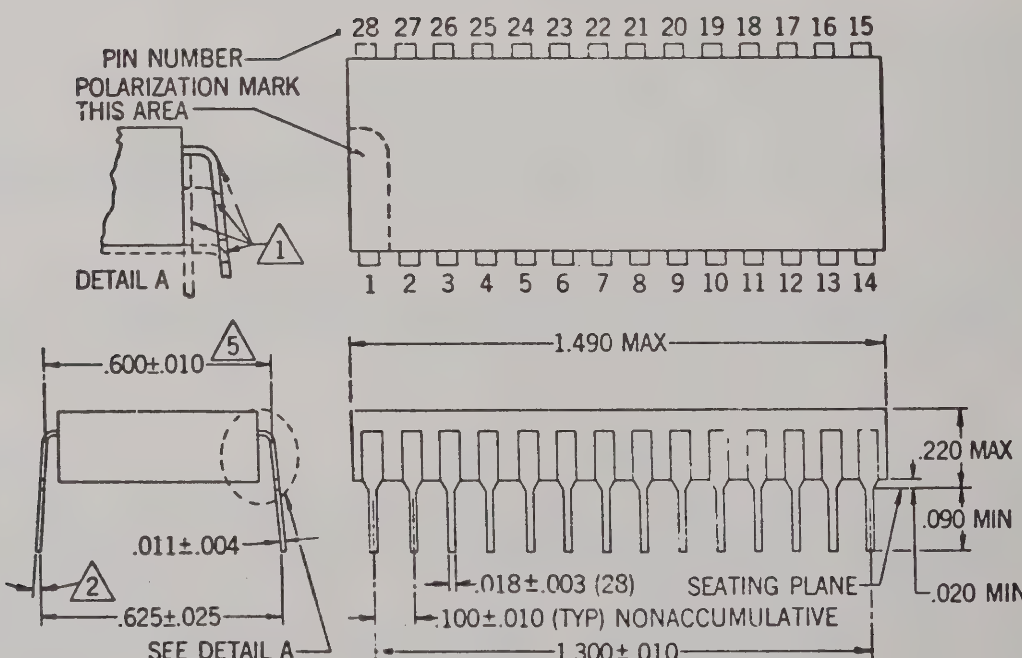
   The plastic package will be identified by a -K suffix to the part no. The K suffix must be included in plastic device part number marking.

2. Operating temperature range: 0°C to 75°C

3. Storage temperature range: -55°C to +150°C

4. The package pins shall conform to the solderability criteria of MIL-STD-883 method 2003 as amended by notices 1 through 4.

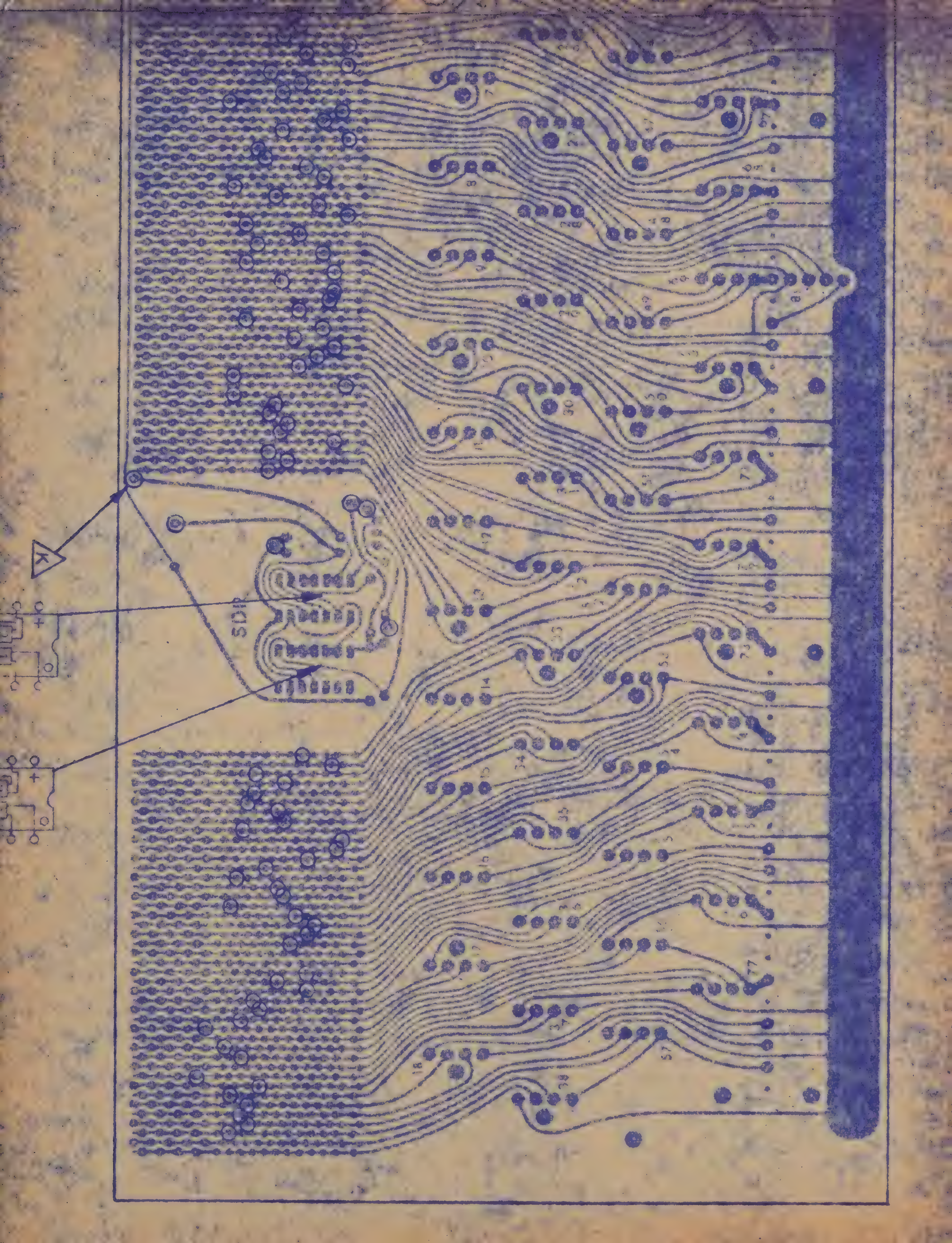


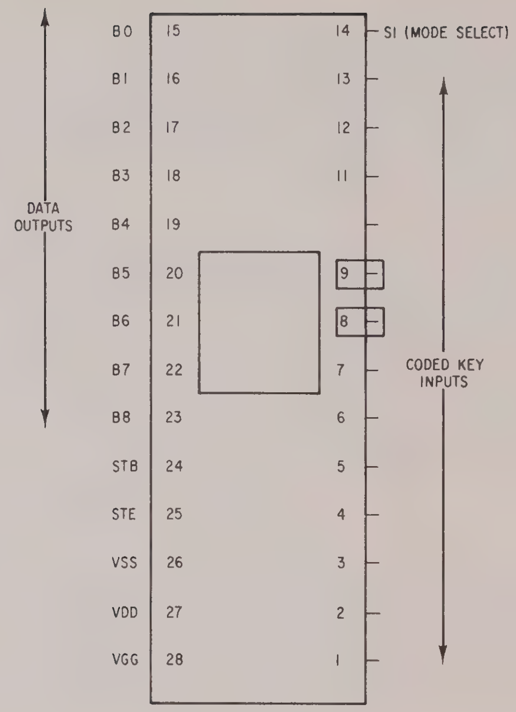


NOTES:

1. Leads may egress from top, side or bottom of package
2. Angle may be 0° to 15°
3. Spacing between exposed conductors shall be .015 min
4. Conductive, accessible, areas on top of package shall be electrically isolated from pins
5. Dimension between center line of leads when formed parallel

Figure 4





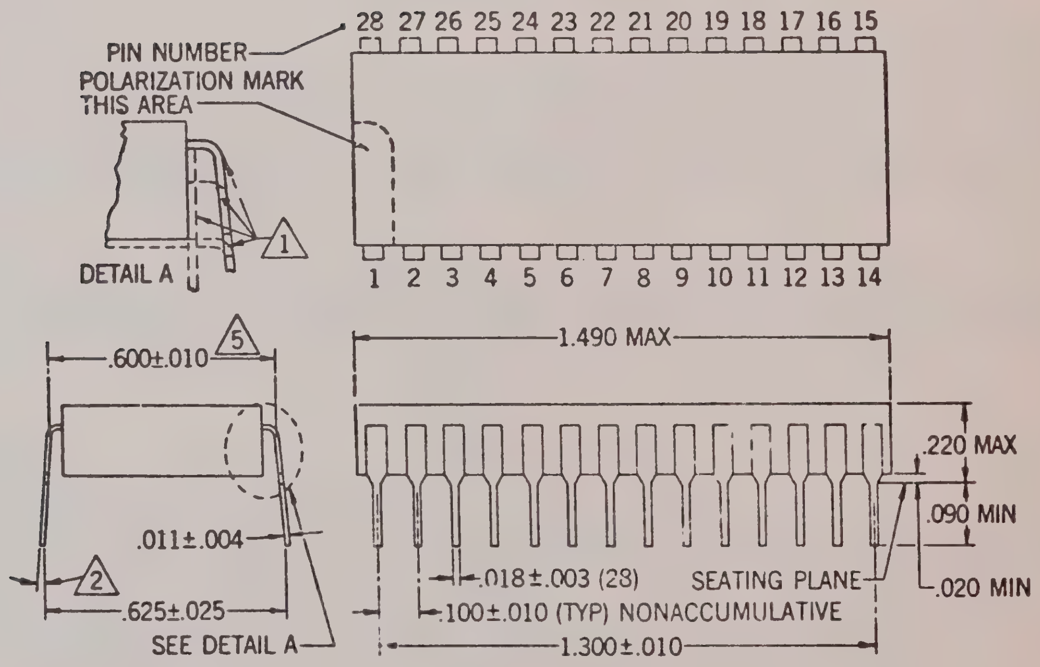


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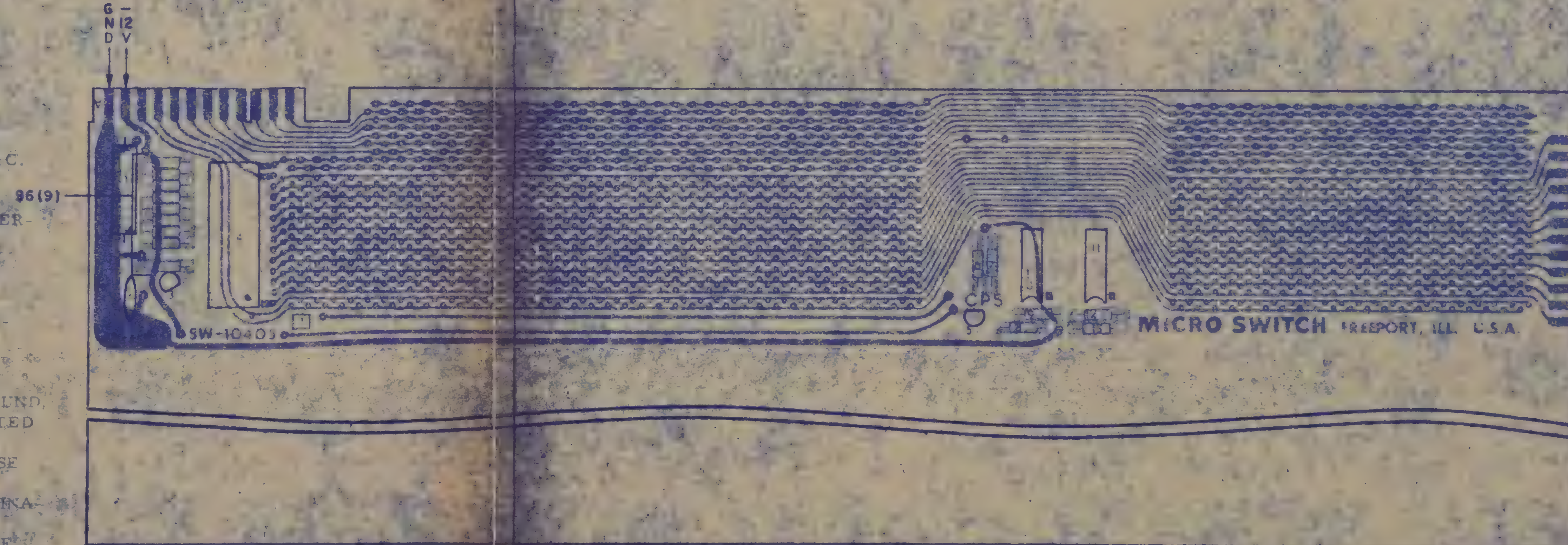
Figure 4

PARTS LIST

LOCATION NO.	DESCRIPTION	
1	15 MFD 35 WVDC	C1
2	.1 MFD 16 WVDC	C2
3	2N5139	Q3
4	MICRO SWITCH SW-~~2[illegible]~~ 20416K	IC4
5	2N4123	Q5
6	390	R6
7	390	R7
8	220	R8
9	750	R9
10	MOTOROLA MC846P	IC10
11	MOTOROLA MC846P	IC11
12	750	R12
13	750	R13
14	330	R1



NOTES:

A. "CPS" REFERS TO COMPONENT MOUNTING SIDE OF P.C. BOARD. "SDR" REFERS TO SOLDERED SIDE OF P.C. BOARD.

B. ALL RESISTORS 1/4 W. CARBON 5% TOL. UNLESS OTHERWISE SPECIFIED.

C. 1% RESISTORS ARE 1/8 W. METAL FILM TYPE.

D. SUPPLY (+) 5.0 ± 0.25 VOLTS DC, MEASURED AT CONNECTOR TERMINALS.

E. ALL CODE DESIGNATIONS SHOWN WITH LEAST SIGNIFICANT BIT TO RIGHT.

F. ABBREVIATIONS: R = RESISTOR, C = CAPACITOR, IC = INTEGRATED CIRCUIT, B = BIT, Q = TRANSISTOR, D = DIODE, F = FUNCTION, STB = STROBE, GND = GROUND, EMD = ELECTRICAL MONITOR DETECTOR, PC = PRINTED CIRCUIT BOARD, J = JUMPER.

G. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

H. DO NOT MAKE CONNECTIONS TO UNIDENTIFIED TERMINATION PADS.

J. NOTATION "2^0" REFERS TO LEAST SIGNIFICANT BIT OF A GROUP, "2^1" THE NEXT HIGHER, ETC.

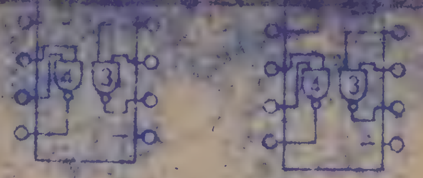
K. CIRCLED PADS DENOTE FEED-THROUGH TYPE ELECTRICAL CONNECTION.

L. EQUIVALENT COMPONENTS MAY BE SUBSTITUTED.

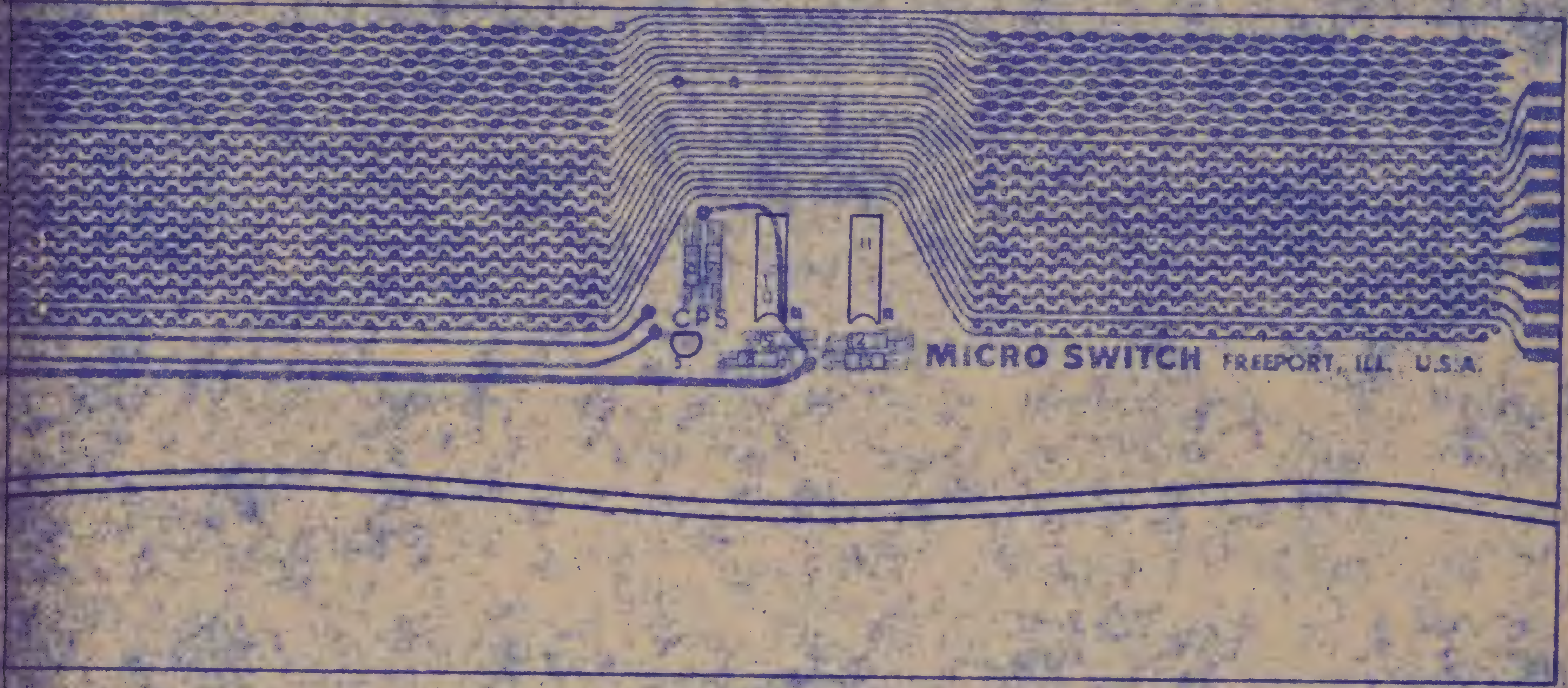
8 BIT TRI MODE, ODD PARITY, MOS, ENCODED, POS. LOGIC, POS. STROBE, N KEY ROLLOVER, ELECTRONIC SHIFT LOCK

MICRO SWITCH FREEPORT, ILLINOIS U.S.A. A DIVISION OF HONEYWELL		THIS DRAWING COVERS A PROPRIETARY ITEM AND IS THE PROPERTY OF MICRO SWITCH, A DIVISION OF HONEYWELL. THIS DRAWING IS NOT TO BE USED WITHOUT THE APPROVAL OF MICRO SWITCH.	
JLS	5 OCT 70		
JRM	6 OCT 70	GENERAL SALES	
BAJ	6 OCT 70	90-11329-37	X3

B	CORRECTED CONNECTOR LABELING	
A	CORRECTED CONNECTOR LABELING	KECO 1
PAGE 1 OF 1		KR
DRAWING NUMBER	C	61SW12-1



IC 10 IC11



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DRAWN JLS 5 OCT70	REPLACES	
ELEC. CHECK URM 6 OCT 70	CUSTOMER GENERAL SALES	
MFG. CHECK BAT [illegible]	SP 90-11329-37	ISSUE NO. X3

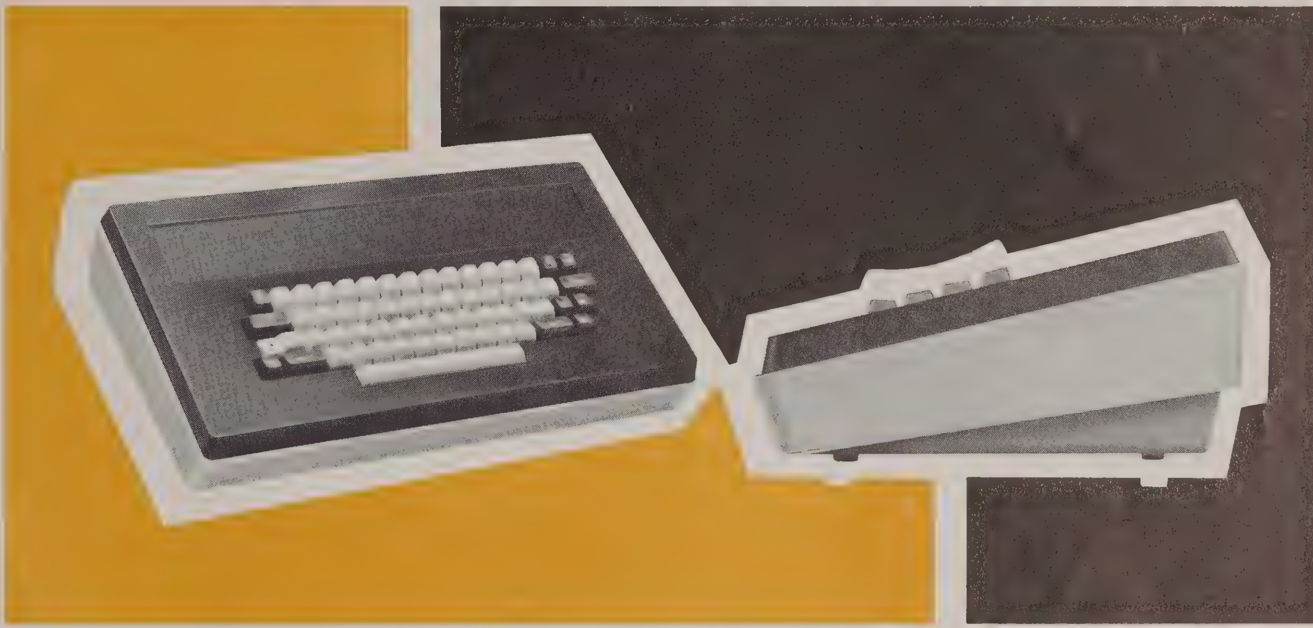
REV. LET.	REVISION		
B	CORRECTED CONNECTOR LABELING	1	[illegible]
A	CORRECTED CONNECTOR LABELING	KECO 1	9-10-70

PAGE 1 OF 1 KR

DRAWING NUMBER **C** 61SW12-1

COMMUNICATION MOS ENCODED KEYBOARD

product sheet **61SW12-1**



features

USASCII CODE ASSIGNMENT WITH FULL CHARACTER SET

SOLID STATE KEYS

HIGH RELIABILITY

"n" KEY ROLLOVER

SCULPTURED BUTTONS FOR CONTOURED TYPING SURFACE

ELECTRONIC SHIFTLOCK WITH LIGHTED KEY

CHARACTER ASSIGNMENT CONFORMS TO THE PROPOSED USA STANDARD FOR ALPHANUMERIC KEYBOARDS X4-A9/199C

MOS encoding, coupled to solid state keys, provides the most reliable and versatile keyboard available today. MOS has greatly increased the number of functions the keyboard can perform, while at the same time allowing significant cost reduction.

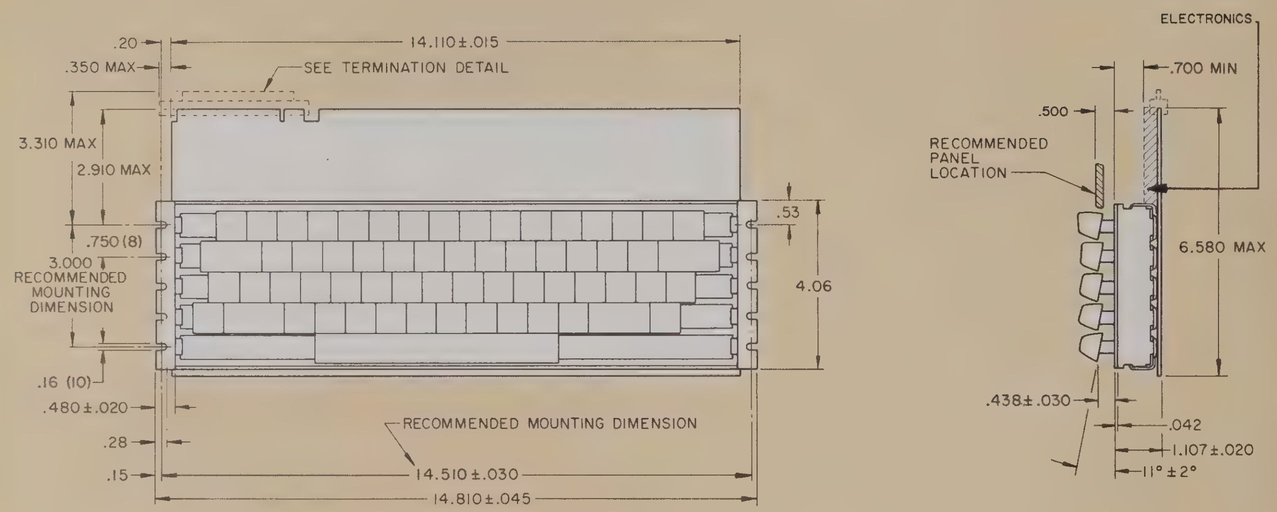
This keyboard has our new "n" key rollover feature. Data bits are set by a pulse from the down stroke of each key depressed and stored in the MOS memory. When a second key is operated, new data is set into the memory even though the first key may be still depressed. Thus there is no possibility of missing a character or of transposing characters as the result of the order of key release. With "n" key rollover any number of keys may be depressed and held depressed and the sequence of release doesn't affect the proper sequence of data entry. The pulsed output is part of the solid state chip within each key, rather than a pulse network of discrete components. This adds significantly to the reliability of the keyboard.

The keyboard is encoded with the seven bit USASCII code plus odd parity. There are three modes of operation. Unshifted mode: lower case alpha and numbers. Shifted mode: upper case alpha and symbols (selected by the shift key). Control mode: control characters (selected by the CTRL key). Strobe and data bits are not generated for keys that do not have character assignments in the control mode. This feature serves as an error indication to the operator when an invalid key in the control mode is depressed.

A new electronic shift lock is incorporated into this keyboard. When the shift lock is depressed the keyboard is put into the shifted mode and it will remain in this mode until either of the shift keys is depressed. The shift lock is lighted to give the operator a visual indication that the keyboard is locked in the shifted mode.

Sculptured buttons provide a contoured typing surface. The top surface of each row of buttons is molded at a slightly different angle to form a dished effect similar to that found on some high quality typewriters. This feature adds to operator comfort as well as the appearance of the keyboard with your equipment.

specifications



ELECTRICAL DATA

Power Requirements	+5 volts DC ±5% 1.0 Ampere max -12 volts DC ±20% @ 5 milliamps max. Keyboard Ground @ 0 volts Note: Tolerances include ripple
Data Key Outputs (Positive logic)	Logic ''O'': +0.6 volts DC max. @ 1.6 milliamps (sinking) Logic ''1'': +2.55 volts DC min. @ 0.12 milliamps max. (sourcing) Timing: Data bits are held in memory until the next key depression.
Strobe Outputs	All keys in unoperated state: +0.6 volts DC max. @ 1.6 milliamps (sinking) Key Operated: +2.55 Volts DC min. @ 0.12 milliamps max (sourcing) pulsed output Pulse Duration: 10 micro seconds min. Timing: Data bits are true prior to strobe pulse.

TERMINATION

Card-edge output with gold-plated terminals accept standard connectors such as:

Cinch Jones #251-12-30-160 with between contact key. (Connector included with this listing.)

ELECTRONIC SHIFT LOCK

The shift lock key locks the keyboard into the shifted mode and a light on the key provides visual indication. By depressing either shift key, the keyboard is returned to the unshifted mode.

KEYROW OFFSET

3/8 - 3/16 - 3/8 inch

KEY SPACING

Keys spaced 3/4 inch center-to-center.

BUTTON ORIENTATION

Stepped with sculptured buttons.

WEIGHT

With Enclosure: 8.75 lbs. approx.
Without Enclosure: 2.5 lbs. approx.

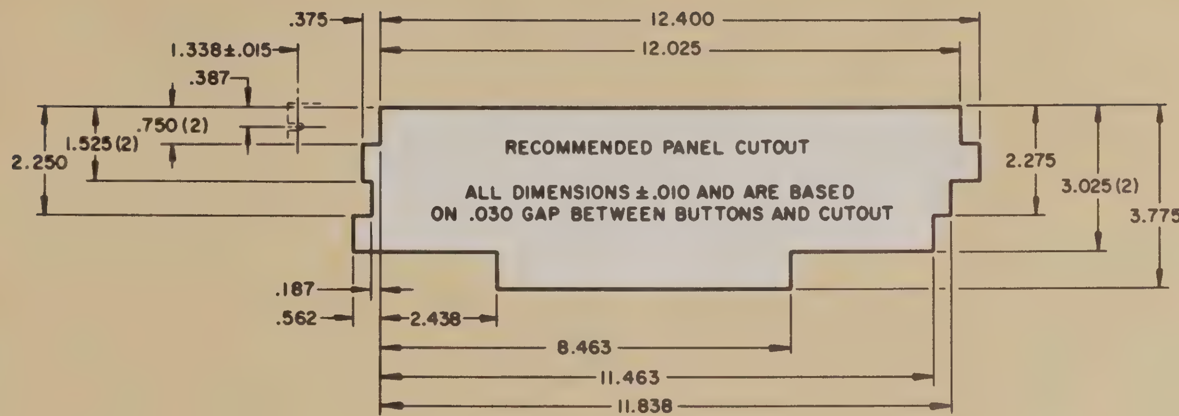
BUTTONS

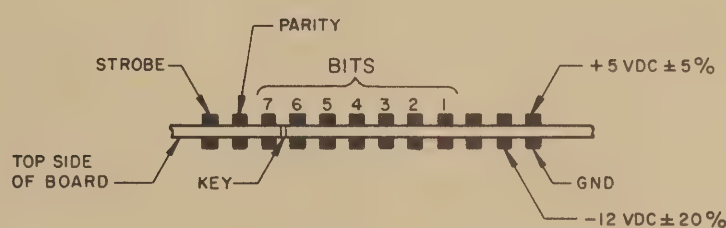
MICRO SWITCH Sculptured button style (two shot molded)

Touch Typing Keys: Button shell off-white, legends dark gray.

Keys 3, 17, 18, 22, 37, 56, 57, 62, 64, 76, 77: Button shell dark gray, legend white.

Key 43: Two-unit/two-level button, light indicator on lower level.

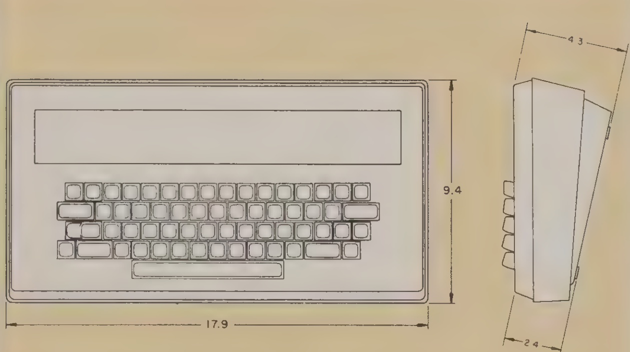




TERMINATION DETAIL

ENCLOSURE

The enclosure cover is dark gray high strength ABS and the base is light gray cast aluminum alloy.



OPTIONS

If the standard features of the 61SW12-1 do not meet your requirements, you may specify the following options:

Memory Control: The keyboard may be specified with a flip-flop enable input to the MOS encoder. This option allows system interaction with the one character memory.

System Control: Input lines can be provided to the keyboard shift circuitry to permit programming of your system to initiate shift. These lines can also be used for mode indication within your system.

Button colors: Any of 25 standard colors.

Legend Colors: Various legend colors (note: lighted shift lock key available only with black legends at this time.)

Without Electronic Shift Lock: Keyboard may be specified with the MICRO SWITCH standard alternate action shift lock rather than electronic shift lock.

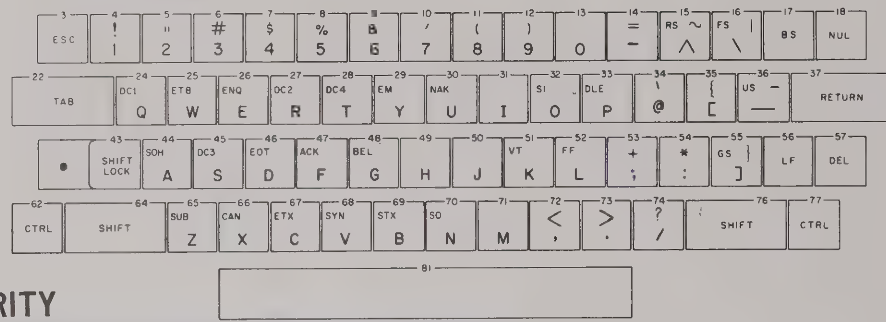
Without Enclosure: The keyboard, under catalog listing 61SW12-2, may be purchased without enclosure or connector.

NOTE: If your requirements for codes and the number of keys do not meet those of the standard 61SW12-1 contact your nearest MICRO SWITCH Branch Office for information on possible modification.

ordering information

Contact your nearest MICRO SWITCH Branch Office and a Field Engineer will be glad to work with you in satisfying your keyboard requirements: proper selection, pricing, and delivery scheduling. These experienced keyboard experts will provide sound and practical answers to your needs.

CODE AND CHARACTER ASSIGNMENT

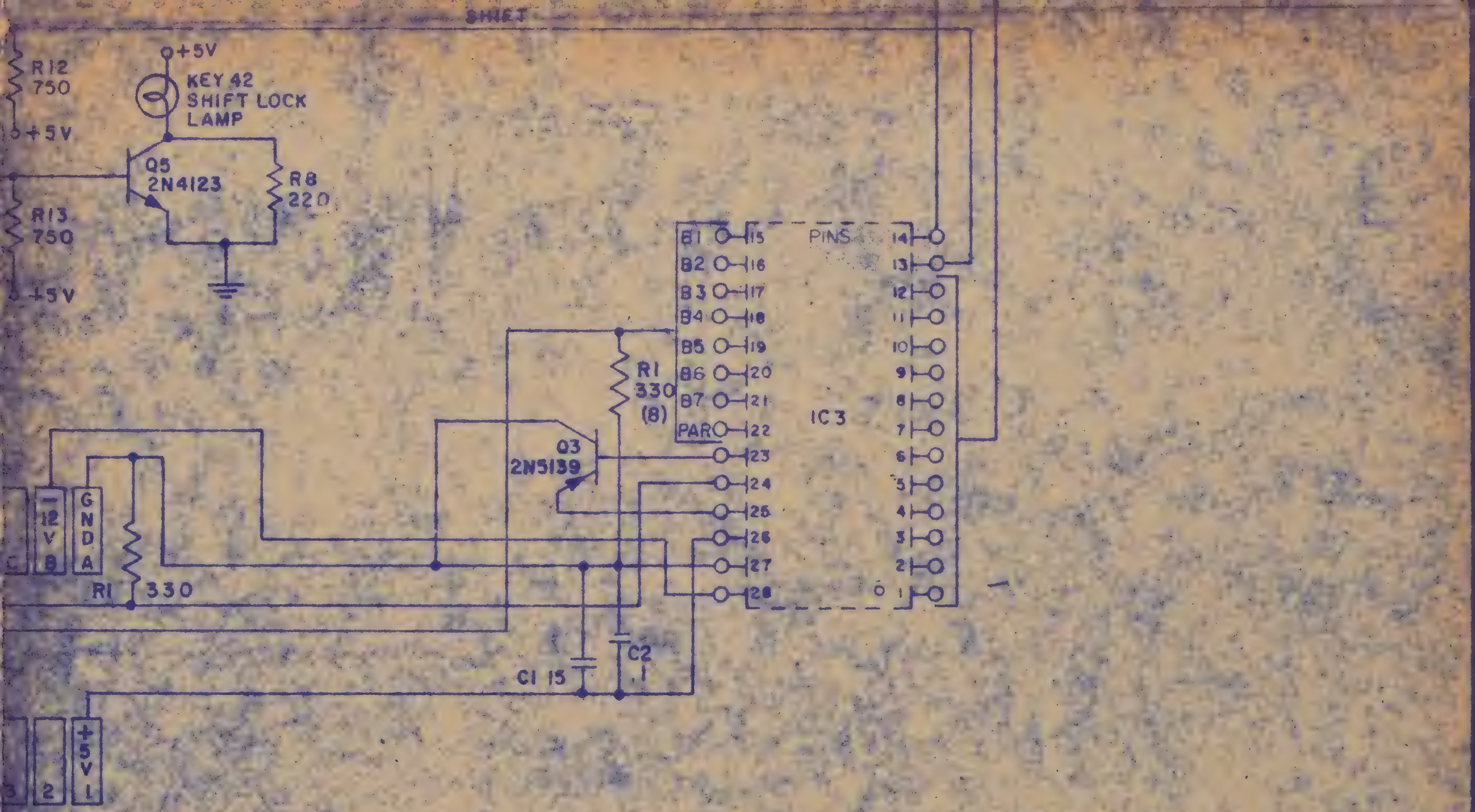


USASCII ODD PARITY

KEY NO.	UNSHIFTED				SHIFTED				CONTROL			
		BITS				BITS				BITS		
	CHAR.	P	765	4321	CHAR.	P	765	4321	CHAR.	P	765	4321
3	ESC	1	001	1011	ESC	1	001	1011				
4	1	0	011	0001	!	1	010	0001				
5	2	0	011	0010	"	1	010	0010				
6	3	1	011	0011	#	0	010	0011				
7	4	0	011	0100	$	1	010	0100				
8	5	1	011	0101	%	0	010	0101				
9	6	1	011	0110	&	0	010	0110				
10	7	0	011	0111	'	1	010	0111				
11	8	0	011	1000	(	1	010	1000				
12	9	1	011	1001	)	0	010	1001				
13	0	1	011	0000								
14	–	1	010	1101	=	0	011	1101				
15	^	0	101	1110	~	1	111	1110	RS	1	001	1110
16	\	1	101	1100	|	0	111	1100	FS	0	001	1100
17	BS	0	000	1000	BS	0	000	1000				
18	NUL	1	000	0000	NUL	1	000	0000				
22	HT	1	000	1001	HT	1	000	1001				
24	q	1	111	0001	Q	0	101	0001	DC1	1	001	0001
25	w	1	111	0111	W	0	101	0111	ETB	1	001	0111
26	e	1	110	0101	E	0	100	0101	ENQ	1	000	0101
27	r	1	111	0010	R	0	101	0010	DC2	1	001	0010
28	t	1	111	0100	T	0	101	0100	DC4	1	001	0100
29	y	0	111	1001	Y	1	101	1001	EM	0	001	1001
30	u	0	111	0101	U	1	101	0101	NAK	0	001	0101
31	i	1	110	1001	I	0	100	1001	HT	1	000	1001
32	o	1	110	1111	O	0	100	1111	SI	1	000	1111
33	p	0	111	0000	P	1	101	0000	DLE	0	001	0000
34	@	0	100	0000	`	1	110	0000	NUL	1	000	0000
35	[	0	101	1011	{	1	111	1011	ESC	1	001	1011
36	—	1	101	1111	—	1	101	1111	US	0	001	1111
37	CR	0	000	1101	CR	0	000	1101				
43	SHIFT LOCK – (Mode Selection Key)											
44	a	0	110	0001	A	1	100	0001	SOH	0	000	0001
45	s	0	111	0011	S	1	101	0011	DC3	0	001	0011
46	d	0	110	0100	D	1	100	0100	EOT	0	000	0100
47	f	1	110	0110	F	0	100	0110	ACK	1	000	0110
48	g	0	110	0111	G	1	100	0111	BEL	0	000	0111
49	h	0	110	1000	H	1	100	1000	BS	0	000	1000
50	j	1	110	1010	J	0	100	1010	LF	1	000	1010
51	k	0	110	1011	K	1	100	1011	VT	0	000	1011
52	l	1	110	1100	L	0	100	1100	FF	1	000	1100
53	;	0	011	1011	+	1	010	1011				
54	:	1	011	1010	*	0	010	1010				
55	]	0	101	1101	}	1	111	1101	GS	1	001	1101
56	LF	1	000	1010	LF	1	000	1010				
57	DEL	0	111	1111	DEL	0	111	1111				
62	CTRL (Mode Selection Key)											
64	SHIFT (Mode Selection Key)											
65	z	0	111	1010	Z	1	101	1010	SUB	0	001	1010
66	x	1	111	1000	X	0	101	1000	CAN	1	001	1000
67	c	1	110	0011	C	0	100	0011	ETX	1	000	0011
68	v	0	111	0110	V	1	101	0110	SYN	0	001	0110
69	b	0	110	0010	B	1	100	0010	STX	0	000	0010
70	n	0	110	1110	N	1	100	1110	SO	0	000	1110
71	m	0	110	1101	M	1	100	1101	CR	0	000	1101
72	,	0	010	1100	<	1	011	1100				
73	.	1	010	1110	>	0	011	1110				
74	/	0	010	1111	?	1	011	1111				
76	SHIFT (Mode Selection Key)											
77	CTRL (Mode Selection Key)											
81	SP	0	010	0000	SP	0	010	0000	SP	0	010	0000

NOTE:

1. Keys that do not have a code assigned in the control mode have no output when the CTRL is operated.
2. If shift or shift lock keys and CTRL key are held depressed, the keyboard will be in mode 3.



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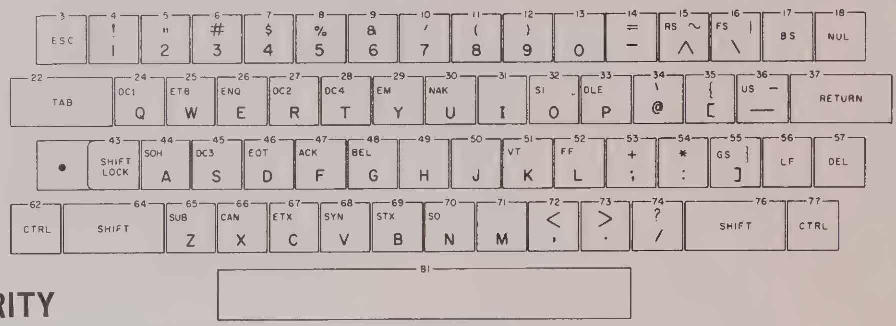
DRAWN JLS	12 OCT 70	REPLACES		
ELEC. CHECK URM	14 OCT 70	CUSTOMER GENERAL SALES		
MECH. CHECK BRJ	15 OCT 70	SP 90-11329-37	ISSUE NO. X 2 3	

REV LET	REVISION		CHANGE BY
B	CORRECTED CONNECTOR LABELING		KM 12-2-70
A	CORRECTED CONNECTOR LABELING & REV DWG	KECO 1	9 NOV 70

PAGE 1 OF 1 KR

DRAWING NUMBER W 61SW12-1

CODE AND CHARACTER ASSIGNMENT



USASCII ODD PARITY

KEY NO.	UNSHIFTED CHAR.	UNSHIFTED BITS P	765	4321	SHIFTED CHAR.	SHIFTED BITS P	765	4321	CONTROL CHAR.	CONTROL BITS P	765	4321
3	ESC	1	001	1011	ESC	1	001	1011				
4	1	0	011	0001	!	1	010	0001				
5	2	0	011	0010	"	1	010	0010				
6	3	1	011	0011	#	0	010	0011				
7	4	0	011	0100	$	1	010	0100				
8	5	1	011	0101	%	0	010	0101				
9	6	1	011	0110	&	0	010	0110				
10	7	0	011	0111	'	1	010	0111				
11	8	0	011	1000	(	1	010	1000				
12	9	1	011	1001	)	0	010	1001				
13	0	1	011	0000								
14	–	1	010	1101	=	0	011	1101				
15	^	0	101	1110	~	1	111	1110	RS	1	001	1110
16	\	1	101	1100	|	0	111	1100	FS	0	001	1100
17	BS	0	000	1000	BS	0	000	1000				
18	NUL	1	000	0000	NUL	1	000	0000				
22	HT	1	000	1001	HT	1	000	1001				
24	q	1	111	0001	Q	0	101	0001	DC1	1	001	0001
25	w	1	111	0111	W	0	101	0111	ETB	1	001	0111
26	e	1	110	0101	E	0	100	0101	ENQ	1	000	0101
27	r	1	111	0010	R	0	101	0010	DC2	1	001	0010
28	t	1	111	0100	T	0	101	0100	DC4	1	001	0100
29	y	0	111	1001	Y	1	101	1001	EM	0	001	1001
30	u	0	111	0101	U	1	101	0101	NAK	0	001	0101
31	i	1	110	1001	I	0	100	1001	HT	1	000	1001
32	o	1	110	1111	O	0	100	1111	SI	1	000	1111
33	p	0	111	0000	P	1	101	0000	DLE	0	001	0000
34	@	0	100	0000	\	1	110	0000	NUL	1	000	0000
35	[	0	101	1011	{	1	111	1011	ESC	1	001	1011
36	—	1	101	1111	—	1	101	1111	US	0	001	1111
37	CR	0	000	1101	CR	0	000	1101				
43	SHIFT LOCK – (Mode Selection Key)											
44	a	0	110	0001	A	1	100	0001	SOH	0	000	0001
45	s	0	111	0011	S	1	101	0011	DC3	0	001	0011
46	d	0	110	0100	D	1	100	0100	EOT	0	000	0100
47	f	1	110	0110	F	0	100	0110	ACK	1	000	0110
48	g	0	110	0111	G	1	100	0111	BEL	0	000	0111
49	h	0	110	1000	H	1	100	1000	BS	0	000	1000
50	j	1	110	1010	J	0	100	1010	LF	1	000	1010
51	k	0	110	1011	K	1	100	1011	VT	0	000	1011
52	l	1	110	1100	L	0	100	1100	FF	1	000	1100
53	;	0	011	1011	+	1	010	1011				
54	:	1	011	1010	*	0	010	1010				
55	]	0	101	1101	}	1	111	1101	GS	1	001	1101
56	LF	1	000	1010	LF	1	000	1010				
57	DEL	0	111	1111	DEL	0	111	1111				
62	CTRL (Mode Selection Key)											
64	SHIFT (Mode Selection Key)											
65	z	0	111	1010	Z	1	101	1010	SUB	0	001	1010
66	x	1	111	1000	X	0	101	1000	CAN	1	001	1000
67	c	1	110	0011	C	0	100	0011	ETX	1	000	0011
68	v	0	111	0110	V	1	101	0110	SYN	0	001	0110
69	b	0	110	0010	B	1	100	0010	STX	0	000	0010
70	n	0	110	1110	N	1	100	1110	SO	0	000	1110
71	m	0	110	1101	M	1	100	1101	CR	0	000	1101
72	,	0	010	1100	<	1	011	1100				
73	.	1	010	1110	>	0	011	1110				
74	/	0	010	1111	?	1	011	1111				
76	SHIFT (Mode Selection Key)											
77	CTRL. (Mode Selection Key)											
81	SP	0	010	0000	SP	0	010	0000	SP	0	010	0000

NOTE:

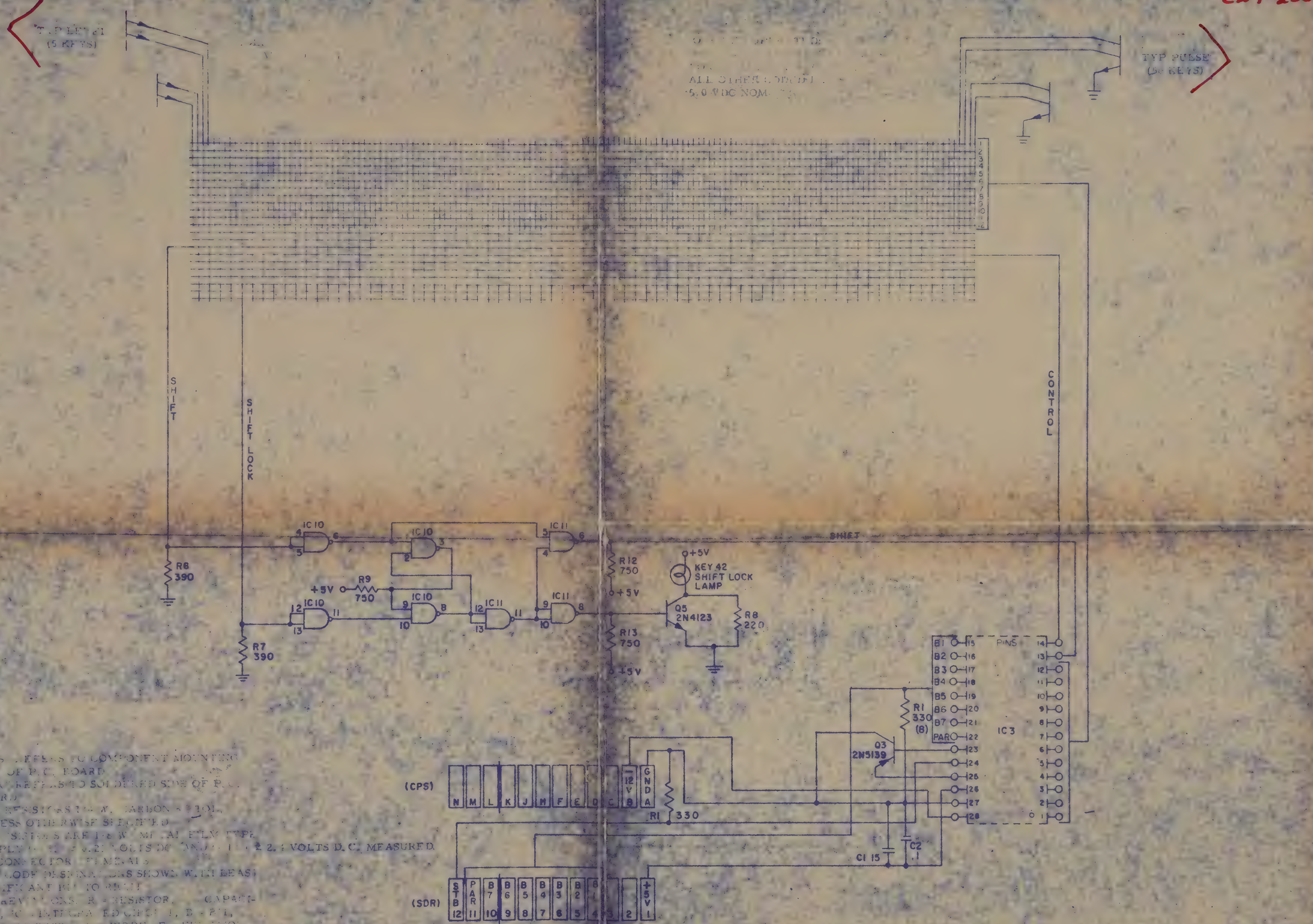
1. Keys that do not have a code assigned in the control mode have no output when the CTRL is operated.
2. If shift or shift lock keys and CTRL key are held depressed, the keyboard will be in mode 3.

84-07226-A 575 PRINTED IN USA

MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

See page A23 Catalog 200

See page A23 Cat 200



NOTES
A. CPS REFERS TO COMPONENT MOUNTING SIDE OF P.C. BOARD
SDR REFERS TO SOLDERED SIDE OF P.C. BOARD
B. ALL RESISTORS [illegible] W, CARBON [illegible] 10%, UNLESS OTHERWISE SPECIFIED
C. [illegible] RESISTORS ARE [illegible] W METAL FILM TYPE
D. SUPPLY [illegible] 5.2 VOLTS DC [illegible] 2.[illegible] VOLTS D.C. MEASURED AT CONNECTOR TERMINALS
E. ALL CODE DESIGNATIONS SHOWN WITH LEAST SIGNIFICANT BIT TO RIGHT
F. ABBREVIATIONS: R = RESISTOR, C = CAPACITOR, IC = INTEGRATED CIRCUIT, B = BIT, Q = TRANSISTOR, D = DIODE, F = FUNCTION, STB = STROBE, GND = GROUND, [illegible]
G. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED
H. DO NOT MAKE CONNECTIONS TO UNIDENTIFIED TERMINATIONS

8 BIT TRI MODE, ODD PARITY
MOS. ENCODED, POS. LOGIC
POS. STROBE, N KEY ROLLOVER
ELECTRONIC SHIFT LOCK

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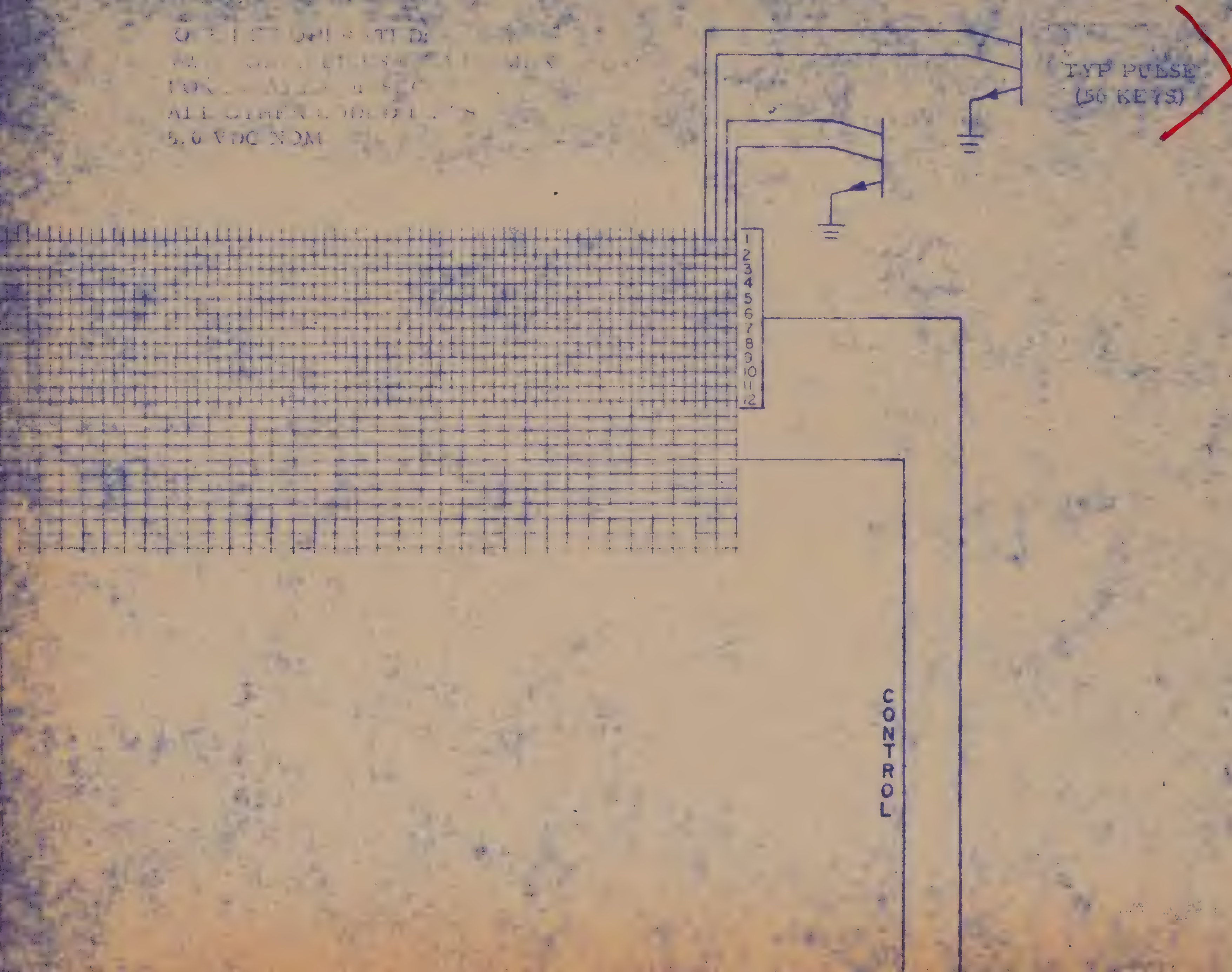
DRAWN	JLS	12 OCT 70	REPLACES
ELEC. CHECK	JPM	14 OCT 70	CUSTOMER GENERAL SALES
MECH. CHECK	BRJ	15 OCT 70	SP 90-11329-37 ISSUE ~~1~~ 2 3

REV LET	REVISION		CHANGE BY
B	CORRECTED CONNECTOR LAYOUT [illegible]		
A	CORRECTED CONNECTOR LABELING & Rev Dwg	KECO 1	9 Nov 70

PAGE 1 OF 1 KK

DRAWING NUMBER W 61SW12-1

see page A23
CNT 200



CONVERSION CHART

Octal	Binary	Octal	Binary	Octal	Binary	Octal	Binary
0	00000000	47	00100111	116	01001110	165	01110101
1	00000001	50	00101000	117	01001111	166	01110110
2	00000010	51	00101001	120	01010000	167	01110111
3	00000011	52	00101010	121	01010001	170	01111000
4	00000100	53	00101011	122	01010010	171	01111001
5	00000101	54	00101100	123	01010011	172	01111010
6	00000110	55	00101101	124	01010100	173	01111011
7	00000111	56	00101110	125	01010101	174	01111100
10	00001000	57	00101111	126	01010110	175	01111101
11	00001001	48 60	00110000	127	01010111	176	01111110
12	00001010	61	00110001	130	01011000	177	01111111
13	00001011	62	00110010	131	01011001	128 200	10000000
14	00001100	63	00110011	132	01011010	240	10100000
15	00001101	64	00110100	133	01011011	241	10100001
16	00001110	65	00110101	134	01011100	242	10100010
17	00001111	66	00110110	135	01011101	243	10100011
20	00010000	67	00110111	136	01011110	244	10100100
21	00010001	70	00111000	137	01011111	245	10100101
22	00010010	71	00111001	96 140	01100000	246	10100110
23	00010011	72	00111010	141	01100001	247	10100111
24	00010100	73	00111011	142	01100010	250	10101000
25	00010101	74	00111100	143	01100011	251	10101001
26	00010110	75	00111101	144	01100100	252	10101010
27	00010111	76	00111110	145	01100101	253	10101011
30	00011000	77	00111111	146	01100110	274	10111100
31	00011001	64 100	01000000	147	01100111	275	10111101
32	00011010	101	01000001	150	01101000	276	10111110
33	00011011	102	01000010	151	01101001	277	10111111
34	00011100	103	01000011	152	01101010	301	11000001
35	00011101	104	01000100	153	01101011	302	11000010
36	00011110	105	01000101	154	01101100	303	11000011
37	00011111	106	01000110	155	01101101	304	11000100
40	00100000	107	01000111	156	01101110	305	11000101
41	00100001	110	01001000	157	01101111	306	11000110
42	00100010	111	01001001	112 160	01110000	307	11000111
43	00100011	112	01001010	161	01110001	310	11001000
44	00100100	113	01001011	162	01110010	311	11001001
45	00100101	114	01001100	163	01110011	312	11001010
46	00100110	115	01001101	164	01110100	313	11001011

Octal	Binary
314	11001100
315	11001101
316	11001110
317	11001111
320	11010000
321	11010001
322	11010010
323	11010010
324	11010100
325	11010101
326	11010110
327	11010111
330	11011000
331	11011001
332	11011010
373	11111011
374	11111100
375	11111101
376	11111110
377	11111111

				PROM Octal Output			
	Mnemonic	Encoder Input	Encoder Binary Output	No Shift	Reg Shift	Sym Shift	Reg & Sym Shift
				13-16	9-12	5-8	1-4
S1	[illegible]	1-2	65	061	041	241	
S2	[illegible]	1-3	66	062	042	242	
S3	[illegible]	1-4	67	063	043	243	
S4	4	2-3	77	064	044	244	
S5	[illegible]	2-4	78	065	045	245	
S6	6	3-4	88	066	046	246	
S7	7	3-5	89	067	047	247	
S8	8	4-5	98	070	050	250	
S9	9	4-6	99	071	051	251	
S10	Ø	5-6	107	060	060	260	
S11	-	5-7	108	055	075	275	
S12	^	6-7	115	136	176	[illegible]	
S13	\	6-8	116	134	174	[illegible]	
S14	Q	1-5	68	121	121	321	
S15	W	1-6	69	127	127	327	
S16	E	2-5	79	105	105	305	
S17	R	2-6	80	122	122	322	
S18	T	3-6	90	124	124	[illegible]	
S19	Y	3-7	91	131	131	[illegible]	
S20	[illegible]	4-7	100	125	125	[illegible]	
S21	I	4-8	101	111	111	311	
S22	O	5-8	109	[illegible]	117	[illegible]	
S23	P	5-9	110	120	120	[illegible]	
S24	@	6-9	[illegible]	[illegible]	140	[illegible]	
S25	[illegible]	6-10	118	[illegible]	173	[illegible]	
S26	RETURN	6-11	119	[illegible]	015	[illegible]	
S27	A	1-7	70	101	101	301	
S28	S	1-8	71	123	123	323	
S29	D	2-7	81	104	104	304	
S30	F	2-8	82	106	106	306	
S31	G	3-8	92	107	107	307	
S32	H	3-9	93	110	110	310	
S33	J	4-9	102	112	112	[illegible]	
S34	K	4-10	103	113	113	[illegible]	
S35	L	5-10	111	114	114	314	
S36	;	5-11	112	073	053	253	
S37	:	6-12	120	[illegible]	[illegible]	[illegible]	
S38	]	6-13	121	[illegible]	[illegible]	[illegible]	

Sw. No.	Mnemonic	Encoder Input	Encoder Binary Output	PROM Octal Output: No Shift	Reg Shift	Sym Shift	Reg & Sym Shift
[illegible]	[illegible]	1-9	72	132	132	332	
S40	[illegible]	1-10	73	130	130	330	
S41		2-9	83	103	103	303	
S42	V	2-10	84	126	126	326	
S43	B	3-10	94	102	102	302	
S44	N	3-13	97	116	116	316	
S45	M	4-13	106	115	115	315	
S46	,	4-12	105	054	074	274	
S47	.	5-12	113	056	076	276	
S48	/	5-13	114	057	077	277	
S49	SPACE BAR	3-11	95	040	040	040	

Mode 2

S51	F1	2A-5	15	022	022	022	
S52	F2	2A-6	16	023	023	023	
S53	F3	2A-7	17	024	024	024	
S54	F4	2A-8	18	025	025	025	
S55	F5	3A-10	30	026	026	[illegible]	
S56	F6	3A-8	28	027	027	027	
S57	F7	4A-10	39	030	030	030	
S58	F8	3A-12	32	031	031	[illegible]	
S59	F9	4A-7	36	032	032	[illegible]	
S60	FØ	4A-8	37	021	021	021	
S61	Special 1	2A-9	19	164	164	[illegible]	
S62	Special 2	3A-13	33	165	[illegible]	[illegible]	
S63	Special 3	3A-11	31	166	[illegible]	[illegible]	
S64	Special 4	4A-9	38	167	[illegible]	[illegible]	
S65	SEND	4A-11	40	035	035	035	
S66	CLR	5A-8	45	142	142	142	
S67	CLR ALL	6A-8	52	143	143	[illegible]	
S68	LINE CLR	5A-9	46	141	141	141	
S69	DEL	6A-9	53	177	177	177	
S70	LINE DWN	5A-10	47	012	012	012	
S71	LINE UP	6A-10	54	013	013	013	
S73	TAB	5A-11	48	011	011	011	
S74	TAB SET	6A-11	55	036	036	036	

				PROM Octal Output			
Ref. Des.	Mnemonic	Encoder Input	Encoder Binary Output	No Shift	Reg Shift	Sym Shift	Reg & Sym Shift
S75	RESET	5A-12	49	014	014	014	
S76	LINE SKIP	6A-12	56	145	145	145	
S77	BKSP	5A-13	50	010	010	010	
S78	SKIP	6A-13	57	146	146	146	
S79	SEND INDEX	1A-9	8	034	034	034	
S80	COPY	1A-8	7	150	150	150	
S81	(blank)	1A-10	9	033	033	033	
S82	NEW LINE	1A-11	10	000	000	000	
S83	SCRN A	1A-13	12	154	154	154	
S84	SCRN B	1A-12	11	160	160	160	
S85	REMOTE/SELECT A	2A-11	21	151	151	151	
	REMOTE/SELECT B	2A-10	20	152	152	152	
S86	REMOTE/ENABLE CCTV						
	REMOTE/ENABLE SCREEN						
S87	ATTEND	3A-7	27	155	155	155	
	UNATTEND	3A-9	29	161	161	161	
S50	REPEAT UP		2				163
	REPEAT DWN		0				156
S72	EDIT UP		1				162
	EDIT DWN		3				153

EXAMPLE:

Symbol

253 Character Code

10101011 Output at Connector A

Pin 1

	Mnemonic	[illegible]	[illegible]	No Shift	Reg Shift	Sym Shift	[illegible] Shift
				−11	[illegible]	[illegible]	[illegible]
[illegible]							
[illegible]	1	[illegible]	[illegible]	001	[illegible]	[illegible]	[illegible]
[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ø	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	∧ ✓	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	\	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Q	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	W	[illegible]	C9	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Y	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	U	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	311	[illegible]
[illegible]	O	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	RETURN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	71	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	81	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	82	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	92	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	103	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	111	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Element	Encoder Input					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	M	[illegible]	106	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	,	[illegible]	105	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	.	[illegible]	113	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	114	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	SPACE BAR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
[illegible]	REPEAT UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	REPEAT DWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	F9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Special 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Special 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Special 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	SEND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CLR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	DEL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LINE DWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LINE UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	EDIT UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	Mnemonic	Encoder Input	Encoder Binary Output	No Shift	[illegible] Shift	[illegible] Shift	[illegible] Shift
[illegible]	RESET	[illegible]-12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LINE SKIP	[illegible]-12	[illegible]	145	145	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]-13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]-17	[illegible]	[illegible]	140	[illegible]	[illegible]
[illegible]	[illegible] INDEX	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	COPY	[illegible]	7	150	150	150	[illegible]
[illegible]	[illegible]	[illegible]-10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	NEW LINE	1A-11	10	[illegible]	500	500	500
[illegible]	SCRN A	1A-13	12	[illegible]	114	[illegible]	[illegible]
[illegible]	SCRN B	1A-12	11	[illegible]	[illegible]	160	[illegible]
[illegible]	REMOTE/SELECT A	2A-11	[illegible]	[illegible]	151	[illegible]	[illegible]
	REMOTE/SELECT B	2A-10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	REMOTE/ENABLE CCTV						
	REMOTE/ENABLE SCREEN						
[illegible]	ATTEND[illegible]	[illegible]-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	UNATTEND	[illegible]-9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXAMPLE:

◇	Symbol
253	Character Code
10101011	Output at Connector A
Pin 1	

PROM Truth Table

Key No.	Mnemonic	Encoder Input	Encoder Binary Output	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
[illegible]	1	1-2	[illegible]	[illegible]	041	[illegible]	[illegible]
[illegible]	2	1-3	[illegible]	[illegible]	042	[illegible]	[illegible]
[illegible]	3	1-4	[illegible]	043	[illegible]	[illegible]	[illegible]
[illegible]	4	2-3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
07	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Ø	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	^	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	\	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	E	2-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	R	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Y	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	U	4-7	100	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	I	4-8	101	111	111	311	311
[illegible]	O	5-8	[illegible]	117	117	[illegible]	[illegible]
[illegible]	P	[illegible]	110	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	@	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	RETURN	6-11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	A	1-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	S	1-8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	D	[illegible]	[illegible]	104	[illegible]	[illegible]	[illegible]
[illegible]	F	[illegible]	[illegible]	[illegible]	106	[illegible]	[illegible]
[illegible]	G	[illegible]	[illegible]	107	[illegible]	[illegible]	[illegible]
[illegible]	H	[illegible]	[illegible]	110	110	[illegible]	[illegible]
[illegible]	J	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	K	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	L	[illegible]	[illegible]	114	[illegible]	[illegible]	[illegible]
[illegible]	;	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Key Dec.	Key [illegible]	Encoder Input	Encoder [illegible] Output	PROM Char Output No Shift	Reg Shift	[illegible] Shift	Reg & Sym Shift
[illegible]	Z	1-9	71	132	132	[illegible]	3[illegible]
540	X	1-10	72	130	130	[illegible]	3[illegible]0
541	C	2-9	83	103	103	301	301
[illegible]	V	3-10	84	126	126	326	326
543	B	3-10	94	102	102	302	302
544	N	4-13	97	116	116	[illegible]	3[illegible]
[illegible]	M	4-13	10[illegible]	115	115	315	315
546	,	[illegible]-13	10[illegible]	054	074	274	274
547	.	[illegible]-13	11[illegible]	05[illegible]	07[illegible]	27[illegible]	27[illegible]
[illegible]	/	[illegible]-13	111	057	077	277	277
[illegible]	SPACE BAR	[illegible]-11	95	040	040	040	040

Mode 2

Key Dec.	Key [illegible]	Encoder Input	Encoder [illegible] Output	No Shift	Reg Shift	[illegible] Shift	Reg & Sym Shift
[illegible]	REPEAT UP REPEAT DWN	[illegible]A-3 [illegible]A-4	2[illegible] 35	15[illegible] 15[illegible]	15[illegible] 15[illegible]	1[illegible] 15[illegible]	1[illegible] 1[illegible]
[illegible]1	F1	2A-5	1[illegible]	022	022	[illegible]	02[illegible]
[illegible]	F2	2A-6	1[illegible]	023	023	023	023
[illegible]	F3	2A-7	17	024	024	024	024
[illegible]	F4	2A-8	1[illegible]	025	025	025	025
555	F5	3A-10	30	026	026	026	026
[illegible]	F6	3A-8	2[illegible]	027	027	027	027
[illegible]7	F7	4A-10	3[illegible]	030	030	030	030
[illegible]	F8	3A-12	3[illegible]	031	031	031	031
[illegible]	F9	4A-7	3[illegible]	032	032	032	032
[illegible]0	FØ	4A-8	37	021	021	021	021
[illegible]1	Special 1	2A-9	1[illegible]	154	154	154	154
[illegible]	Special 2	3A-10	3[illegible]	1[illegible]	15[illegible]	15[illegible]	1[illegible]
[illegible]	Special 3	3A-11	31	1[illegible]	1[illegible]	1[illegible]	1[illegible]
[illegible]4	Special 4	4A-9	38	157	157	157	157
[illegible]	SEND	4A-11	40	035	035	035	035
[illegible]	CLR	5A-8	4[illegible]	14[illegible]	142	14[illegible]	14[illegible]
[illegible]7	CLR ALL	6A-8	5[illegible]	14[illegible]	143	143	143
[illegible]	LINE CLR	5A-9	4[illegible]	141	141	141	141
[illegible]	DEL	6A-9	5[illegible]	177	177	177	177
570	LINE DWN	5A-10	47	012	012	012	012
571	LINE UP	6A-10	54	013	013	013	013
[illegible]	EDIT UP EDIT DWN	[illegible]A-4 [illegible]A-3	34 [illegible]	152 15[illegible]	152 151	152 15[illegible]	152 15[illegible]
57[illegible]	TAB	5A-11	48	011	011	011	011
574	TAB SET	6A-11	55	030	030	030	030

Sel. Des.	Mnemonic	Encoder Input	Encoder Binary Output	PROM Octal Output: No Shift	Reg Shift	Sym Shift	Reg & Sym Shift
[illegible]	RESET	5A-12	49	014	014	014	014
S76	LINE SKIP	6A-12	[illegible]	145	145	[illegible]	[illegible]
S77	BKSP	5A-13	50	010	010	[illegible]	010
S78	SKIP	6A-13	57	[illegible]	140	[illegible]	140
S79	SEND INDEX	1A-9	8	034	034	034	[illegible]
S80	COPY	1A-8	7	[illegible]	[illegible]	[illegible]	[illegible]
S81	(Blank)	1A-10	9	033	[illegible]	[illegible]	033
S82	NEW LINE	1A-11	10	000	000	000	000
S83	SCRN A	1A-13	12	154	154	[illegible]	[illegible]
S84	SCRN B	1A-12	11	[illegible]	[illegible]	[illegible]	[illegible]
S85	REMOTE/SELECT A REMOTE/SELECT B	2A-11 2A-10	21 20	[illegible] 152	151 152	[illegible] [illegible]	151 152
S86	REMOTE/ENABLE CCTV REMOTE/ENABLE SCREEN						
S87	ATTEND UNATTEND	3A-7 3A-9	27 [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] 181

EXAMPLE:  Symbol

253 Character Code

10101011 Output at Connector A

Pin 1

CONVERSION CHART

Octal	Binary		Octal	Binary	Octal	Binary	Octal	Binary
0	00000000	1	47	00100111	116	01001110	165	01110101
1	00000001	2	50	00101000	117	01001111	166	01110110
2	00000010	3	51	00101001	120	01010000	167	01110111
3	00000011	4	52	00101010	121	01010001	170	01111000
4	00000100	5	53	00101011	122	01010010	171	01111001
5	00000101	6	54	00101100	123	01010011	172	01111010
6	00000110	7	55	00101101	124	01010100	173	01111011
7	00000111	8	56	00101110	125	01010101	174	01111100
10	00001000	9	57	00101111	126	01010110	175	01111101
11	00001001	10	60	00110000	127	01010111	176	01111110
12	00001010	11	61	00110001	130	01011000	177	01111111
13	00001011	12	62	00110010	131	01011001	200	10000000
14	00001100	13	63	00110011	132	01011010	240	10100000
15	00001101	14	64	00110100	133	01011011	241	10100001
16	00001110	15	65	00110101	134	01011100	242	10100010
17	00001111	16	66	00110110	135	01011101	243	10100011
20	00010000		67	00110111	136	01011110	244	10100100
21	00010001		70	00111000	137	01011111	245	10100101
22	00010010		71	00111001	140	01100000	246	10100110
23	00010011		72	00111010	141	01100001	247	10100111
24	00010100		73	00111011	142	01100010	250	10101000
25	00010101		74	00111100	143	01100011	251	10101001
26	00010110		75	00111101	144	01100100	252	10101010
27	00010111		76	00111110	145	01100101	253	10101011
30	00011000		77	00111111	146	01100110	274	10111100
31	00011001		100	01000000	147	01100111	275	10111101
32	00011010		101	01000001	150	01101000	276	10111110
33	00011011		102	01000010	151	01101001	277	10111111
34	00011100		103	01000011	152	01101010	301	11000001
35	00011101		104	01000100	153	01101011	302	11000010
36	00011110		105	01000101	154	01101100	303	11000011
37	00011111		106	01000110	155	01101101	304	11000100
40	00100000		107	01000111	156	01101110	305	11000101
41	00100001		110	01001000	157	01101111	306	11000110
42	00100010		111	01001001	160	01110000	307	11000111
43	00100011		112	01001010	161	01110001	310	11001000
44	00100100		113	01001011	162	01110010	311	11001001
45	00100101		114	01001100	163	01110011	312	11001010
46	00100110		115	01001101	164	01110100	313	11001011

Octal	Binary
314	11001100
315	11001101
316	11001110
317	11001111
320	11010000
321	11010001
322	11010010
323	11010011
324	11010100
325	11010101
326	11010110
327	11010111
330	11011000
331	11011001
332	11011010
373	11111011
374	11111100
375	11111101
376	11111110
377	11111111

CONVERSION CHART

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5	00000101	54	00101100	123	01010011	172	01111010
6	00000110	55	00101101	124	01010100	173	01111011
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20	00010000	67	00110111	136	01011110	244	10100100
21	00010001	70	00111000	137	01011111	245	10100101
22	00010010	71	00111001	140	01100000	246	10100110
23	00010011	72	00111010	141	01100001	247	10100111
24	00010100	73	00111011	142	01100010	250	10101000
25	00010101	74	00111100	143	01100011	251	10101001
26	00010110	75	00111101	144	01100100	252	10101010
27	00010111	76	00111110	145	01100101	253	10101011
30	00011000	77	00111111	146	01100110	274	10111100
31	00011001	100	01000000	147	01100111	275	10111101
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45	00100101	114	01001100	163	01110011	312	11001010
46	00100110	115	01001101	164	01110100	313	11001011

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332	11011010
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374	11111100
375	11111101
376	11111110
377	11111111